



Volume 3 Number 10

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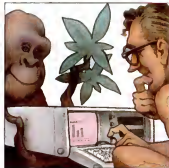
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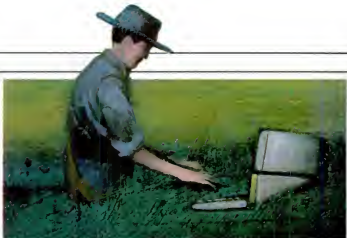
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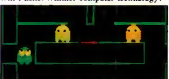
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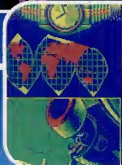
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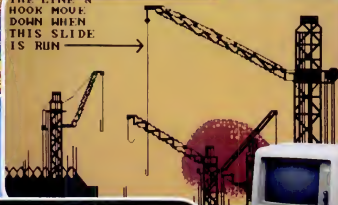
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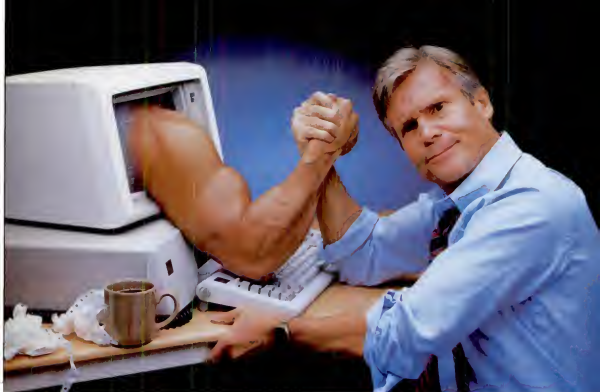


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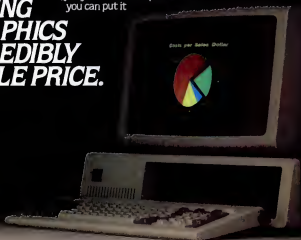
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CIRCLE 117 ON READER SERVICE CARD



What's Inside

Two industry titans dominate this issue of PC: IBM is trying to reclaim part of the PC aftermarket with its portable PC, and AT&T is setting the pace for UNIX-based operating systems.

Ed the bartender, noticing that I had been nursing a Shirley Temple for 2 hours, came over and began wiping the counter next to my glass. "Can I get you anything?" he asked, none too sympathetically.

"Yeah," I answered morosely, staring at my reflection in the ginger ale. "How about getting me a good idea of how to write 'What's Inside'?"

"What's inside what?"

I heaved a sigh and replied, "It's the introductory column in *PC Magazine*. They expect me to come up with something excruciatingly clever every 2 weeks! I can't, I tell you! It's not human!"

The bartender grabbed the glass I had picked up in my hysteria. "Look," he said soothingly, handing me a cocktail napkin to wipe my eyes with. "I've got an idea. Why don't you tell me what's going to appear in *PC* and maybe together we can come up with some way for you to write about it."

That didn't seem such a bad idea to me.

"Well, for starters," I began, "this was the second time this year that we changed the cover at the last minute. Originally, we were going to feature the first part of a six-part series on databases. That's an absolutely enormous project, and it was plotted out like a real battle plan. Associate editor Stephanie Stallings is in charge of that one, and she's doing a



bang-up job." I sighed. "But that got pushed back an issue. We are including another of Stallings' projects: the first of a two part series on UNIX and UNIX-like operating systems."

"What in the world are they?"

"Operating systems based on UNIX, an operating system that was developed by Bell Labs. Everybody's going to use it—that's the rumor, at least. They say it's going to replace PC-DOS. Even IBM has gotten involved—it's put out its own version, PC/IX. Stallings found some great writers to work on it."

Ed leaned forward, totally ignoring the three customers who had just sat at the

other end of the bar. "Like who?"

"Well, Kaare Christian, for one. He's a really interesting guy. He's written an excellent book on UNIX, and he also designs computer systems from scratch for scientists at Rockefeller University—they do things like convert the mating patterns of fruit flies into figures that can appear on a spreadsheet.

"He wrote an article about QNX, a UNIX-like operating system by Quantum Software Systems, Inc. Apparently, the system is excellent at multitasking and multiuser operations. He also wrote about XENIX, a licensed UNIX operating system put out by Microsoft.

"Tom Plum is another fascinating character. He was originally the subject of a *PC* article, in Volume 3 Number 5, where he talked about strengths and weaknesses of the C language. Well, it turns out that besides being a really good writer he's also an expert on UNIX, so we drafted him for this issue. He reviewed Whitesmiths' Co-Idris, which is yet another UNIX-like operating system. What's unusual about this one is that it shares the machine with DOS.

"Mark Zachmann, who's a frequent contributor to *PC Magazine*, gave us a fine introduction to UNIX, describing what makes a system UNIX-like. And Eric Raymond has written a history of UNIX and a primer for the new user."

WHAT'S INSIDE

"Okay," Ed interrupted. "So what happened to the database cover?"

"Nothing. It was just put aside in favor of a cover on alternate input devices. Bill Howard wrote an article on that, and he came up with some pretty weird and wonderful PC peripherals."

"Okay. So that's your cover?"

I laughed bitterly. "Not a chance. IBM saw to that. Remember earlier this year, when I told you how we all had to scurry because Big Blue suddenly decided to introduce the PCjr? Well, they pulled the same thing on us this time. All of a sudden we got a mailgram telling us that the new Portable PC is on its way. The next day the machine showed up, and there was our cover."

"Actually, while the rest of us were going berserk trying to meet our deadlines, editor Bill Machrone was having the time of his life. He's a true-blue enthusiast, and he's been championing at the bit ever since he was promoted to official editorship. But when the Portable PC came in, and some really fast reviewing had to be done, he was in his element. He got a chance to play with it, tear it apart, and really see how the new computer ticked. The editorial staff hasn't seen him this happy in months."

The three people at the end of the bar began making gestures of impatience. One very large gentleman with a rather red face shouted, "Hey! Can we have some service here?" Ed waved them off and asked me to go on.

"Of course, things couldn't be quite that simple. We are, after all, talking about *PC Magazine*. So the first Portable PC we got immediately decided to go on the friz. Seems that the boys at IBM had sent us a test model, and after the people at *PC Week* got through playing touch football with it, the poor thing just gave up the ghost. So IBM had to hurry another one out to us."

"Actually, nobody at the editorial offices got really excited about the portable until IBM sent over the carrying case. Talk about high class! If IBM ever decides

to give up computers, they've got a good thing going in the luggage business."

The customers in the back looked sort of peeved by now. The big gentleman squared his shoulders and was just about to march over when a tall young man with a brown beard strolled into the bar and over to us. The big man changed his mind.

"Hey there," the newcomer grinned, and picked up my glass. "How's things at PC these days?"

Ed the bartender looked at me inquiringly. "Ed," I said, "this is Brad Lemley, one of our free-lance writers. He did a piece for us on PCs in the White House."

If IBM ever decides
to give up
computers, they've
got a good thing
going in the luggage
business.

"They've got computers in D.C.?" asked Ed, amazed. "Who'd have thought it?"

Lemley started to talk it up. "Well, originally, executive editor Mike Edelhart was reading this article in the *New York Times* about John F. W. Rogers. He saw an IBM PC next to Rogers in the photo, and he thought, 'Gee whiz, I wonder if he uses that for anything?' He called me, and I called the executive office of the President, and they turned me over to John Rogers, and Rogers sent me to a guy named Tom Lewis. Tom Lewis is the guy who put together this incredibly user-friendly system. And so the process of doing the story involved going to Tom Lewis' office about four or five times, plus one trip to John Rogers' office."

"Each time I had to go through White House security, which means calling ahead so they know who you are. Then

when you go to the front desk, they push a button and it types out whether or not you're supposed to come in at a particular time. They're a little more security-conscious than they used to be."

"Did Rogers and Lewis like the idea of you doing a story about their operation?"

"They both said they had been waiting for a forum to tell the world about it," Lemley said. "I also talked with other systems people who have seen it, both in the government and outside it, and they were universally enthusiastic about it."

Lemley nodded at us, drained his glass, and left. Ed looked at me. "So that's a writer, huh?"

"Well, that's one of them."

"Do they all look like that?"

I considered. "No, not all. And not all of our writers are free-lance. For example, there's associate editor Barbara Krasnoff. She's only been at PC for a few months and has been volunteering for articles about organizations and software companies—wouldn't go near a piece of computer, or at least anything that didn't boot up *WordStar*. Well, Mike Edelhart looked around and finally found something small enough and user-friendly enough that even Krasnoff couldn't plead off—the new Hewlett-Packard ink jet printer."

"First, he sent her to talk to the Hewlett-Packard people and let her think that was all she had to do. Then, when the printer arrived, he let the package sit on her desk until she opened it and set it up out of pure curiosity. Well, Edelhart had her then—if she could set the printer up, there was no reason why she couldn't review it."

I looked at my watch. It was already four o'clock and the article was due in 1 hour. "Well Ed," I said, sliding off my stool, "it was really nice talking to you. I sure feel better, although I still don't know what I'm going to do about 'What's Inside.'"

"Best of luck," he answered. "Just try to write naturally. Something will come to you."

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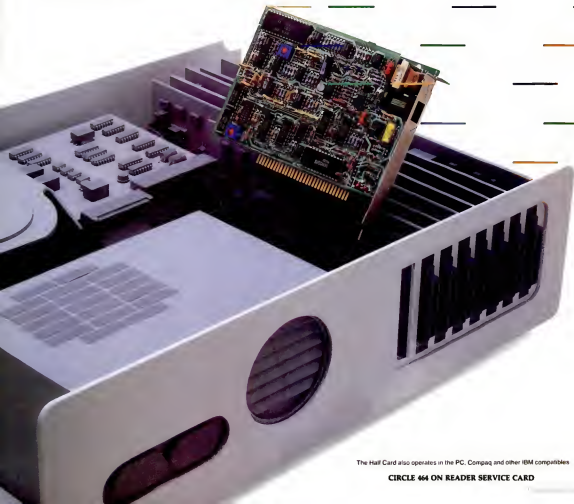
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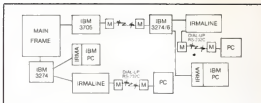
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IBM News

FROM THE EDITORS OF PC

MAY 29, 1984

IBM Touches More Bases

New products in IBM's line make links high and low between its mainframes, PCs, and a new minicomputer. New monitor puts fresh color in Junior's chips.

BY KAREN COOK AND CONNIE WINKLER

NEW YORK—IBM has taken several big steps to tie together its varied office workstations and the IBM PC—but without the benefit of a local area network. During a multi-product announcement, the company also introduced a \$429 color monitor for the PCjr, a move that some industry watchers read as a sign of coming changes to bolster PCjr sales and acceptance.

Not to be one-upped by AT&T's \$10,000 multi-user, super micro announcement the week before, IBM plugged a

new model of its year-old System/36. Available this month, the System 36/Model 5362 handles up to 86 terminals (including PCs), fits under a desk, and starts at \$13,000.

"We are moving the PC, IBM's computer for all seasons, into the office systems mainstream," said Philip D. Estridge, president of the Entry Systems Division in Boca Raton, Florida, which markets the PC.

Jr Configuration

The announcement of the

new 16-color, \$429 monitor for the PCjr came amid reports that IBM might cut PCjr prices as much as 30 percent to boost slow sales—or would begin selling the monitor as part of a single-configuration package costing about \$1,600.

And does IBM plan to redesign PCjr's much criticized chiclet-style keyboard? "We

think you can type on it," countered Estridge. "We'll let the customers decide."

Estridge added that third-party peripherals manufacturers are producing add-on memory boards, better keyboards, and other products for PCjr.

IBM's new software releases are intended to provide a

(continued)

No PC Competitor In AT&T Line-up

New computer contender opens with multi-user, \$9,950 super-micro running UNIX

BY CONNIE WINKLER

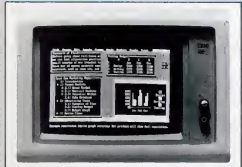
NEW YORK—AT&T is lunging into the computer industry armed with six 32-bit minis, a 32-bit micro, and two networks—including one that connects IBM PCs—but with no head-to-head competitor for the PC. The personal computer may come later this year, AT&T officials hinted.

The 32-bit micro unveiled at the well-orchestrated press conference here recently, the 3B2 Model 300, is a multi-user \$9,950 supermicro that runs

UNIX System V (as do all the products) and supports up to 18 terminals, including IBM PCs. Missing is any immediately available AT&T software, which will come from the resellers that already handle 30 to 40 percent of the computer products sold today, said Robert J. Casale, president of marketing and sales for the new computer company, AT&T Information Systems of Morristown, New Jersey.

(continued)

FRAMEWORK'S POWERFUL OUTLINE



Outlining is the nifty function that makes Framework a package to write about. The story on page 39. Meet the creator, page 62.

IBM Bases (continued)

"framework" for the office computing systems, according to Robert J. Murphy, director of IBM's Office Systems planning in the National Accounts Division. "We had a variety of office systems that couldn't talk to each other. What we have done is standardize interfaces so that they all have a common document architecture," he said.

Ever since the PC landed on bosses' desks, IBM customers have complained that there's no technically easy way to swap files between the PC and the secretary's workstation, the popular IBM Displaywriter (introduced in 1979).

New Word Processors

IBM's solution: Two new word processing packages for the boss, *DisplayWrite 2* for the PC, XT, or PC Portable with 256K (at home or in the office) and *DisplayWrite I* for the PC or PCjr with 128K (again at home or in the office). Then, with a \$375 program called *DisplayComm BSC*, the *DisplayWrite* documents can be transmitted with bisynchronous communications either to the *Displaywriter* word processor or to another IBM office system product.

DisplayWrite 1, at \$95, has fewer functions, but makes handy use of the PCjr's keyboard. *DisplayWrite 2* (\$299) is similar to *Displaywriter Textpack 4*, one of the office-oriented packages that runs on the *Displaywriter*. *DisplayWrite 2* has advanced functions and runs

on the 3270-PC.

For users with the 5520 Administrative Systems and the *Datamaster System/23* (word processors from another of IBM's old internal divisions) there's *PCWriter* for \$199. *PCWriter* mimics these systems on the PC. For these users IBM now also has a scheme for easier exchange of documents between PCs and the 5520, with the 5520 acting as a controller.

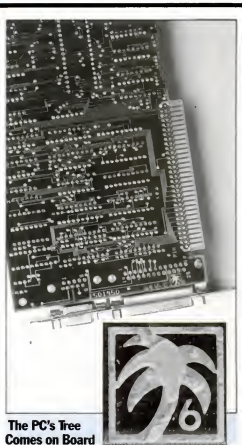
Easier connection schemes were also announced to go between the PC and the Systems 36 and 38, and between the PC and mainframes running *PROFS* (*Professional Office Systems*), an electronic mail package optimized for executives.

Connections

IBM announced its intention to connect the PC and 3270-PC to its mainframes' running word processing under DISOSS (Distributed Office System), and some communications enhancements for the 8100 family and the IBM Series/1.

And, IBM added one nice condiment to the plate of interconnection announcements: PC users can now also connect to the *Displaywriter*'s nifty IBM 5218 printwheel sheet-fed printer.

All the products announced at the April 3 press conference are now available except for *DisplayWrite 1*, to come in July. The PCjr color display and text processing programs are available through IBM Product Centers, IBM sales staffs, and authorized IBM PC dealers. ■



The PC's Tree Comes on Board

We were surprised to find a tree in the IBM Personal Computer, so we launched a contest to discover if anyone else had found it, too (see "The PC's Secret Tree" on page 60 in *PC*, Volume 3 Number 7).

The answer? As you can see in this photo, the tree is part of the solder tracing on an IBM circuit board—in fact, it can be found on most boards used in the IBM PC. We received the first successful answer—and they're still coming in—from James M. Stripe, of Evansville, Indiana, who found the tree on his IBM color/graphics adapter. To congratulate Stripe for his sharp eye and swift envelope, we're sending him a copy of *PC Crayon*, a color graphics program from PC Software of San Diego, California.

Another reader wasn't the first to tell us the answer, but he told us something we didn't know before. Allen Vogl, of Melbourne, Florida, knew that this palm tree is the logo of Tropical Circuits, a Ft. Lauderdale, Florida manufacturer that provides IBM with printed circuit boards. The picture was familiar to Vogl because his company also uses Tropical Circuits' products...but this business association may be ending. Vogl said that Tropical Circuits now has so much business from IBM that it's had to cut back on other customers, including himself. ■



The \$13,000 IBM System 36/Model 5362, smaller than a two drawer file cabinet, fits under a desk and can handle up to 86 terminals, including IBM PCs.

IBM Joins Sears and CBS in Videotex Scene

PCjr plays key character part in a slowly unrolling worldwide plot

NEW YORK—For years, videotex has been touted as the home information system of the future. Now IBM seems ready to give videotex the push it needs to get off the ground.

Earlier this year IBM announced a joint venture with Sears and CBS to market videotex services, although nothing will be available for several years. Thomas C. Papes, assistant group executive of IBM's Information Systems Groups and a former IBM vice president, has been named to head the IBM-CBS-Sears venture. Another IBM executive, William W. Seelinger, manager of videotex market development for IBM, will chair the Videotex Industry Association for 1984.

Now IBM has announced a

package that will turn PCs and XT's into videotex terminals, priced at \$250, and a version for the PCjr priced at \$220. The product will go on sale in October.

Popular in Europe

Although videotex is popular in Europe, PC users won't find much to do with their videotex terminals in the United States. IBM may be trying to make its own market; as some observers have pointed out, the PC didn't have any software when it was first introduced, either.

Since videotex services, when they do appear, will be designed mainly for home use, IBM's videotex announcements may eventually hold particular importance for PCjr sales.

With videotex, users can receive frames of text and graphics—sent by cable or broadcast—on television sets or computer monitors. Videotex systems are potentially interactive; users might call the Sears catalog up on screen, for example, then punch a few computer keys to order a new shirt.

The only commercial U.S. videotex service is Viewtron, launched in southern Florida last year by the Knight-Ridder newspaper chain. Knight-Ridder estimates that Viewtron will

have 5,000 subscribers by next fall, far below original predictions of 150,000 subscribers.

High cost may be one reason for Viewtron's poor showing, experts say. In addition to paying \$12 a month for the videotex service, users must buy a \$600 dedicated videotex terminal supplied by AT&T.

IBM already sells software that allows its Series 1 computer to handle videotex database as well as terminal functions. The system handles only 32 users at once.



When videotex finally spreads its wings, it may fly on PCjr's new color monitor.

AT&T (continued)

"There are a number of products we are not announcing today," Casale told the standing-room-only audience at AT&T's new Manhattan offices which are directly across the street from IBM's new building. Nor did these announcements have any "direct bearing," he said, on AT&T's licensing agreement with Convergent Technologies, presumed by industry experts to be for a microcomputer.

Desktop Supermicro

AT&T's 3B2/300 is a sleek, technically super micro designed around the Bell Laboratories' 256K chip and the Western Electric 32000 microprocessor. It's estimated to have a power of .5 MIPS (millions of instructions per second), but AT&T officials wouldn't substantiate that figure at the conference.

The 3B2/300 was exhibited with the sophisticated Teletype 5620D dot-mapped display (which also has a 32000). The display measures 15 inches diagonally and has resolution of

800 by 1024 pixels and comes with a bright red, three-button mouse. The 5620D costs \$6,115.

Boards for connecting IBM PCs easily can be inserted into the 3B2/300.

I/O boards slip into the diminutive machine's side. Serial terminal connections are made (of course) with telephone-style modular connectors, a great space saver over the more common 25-pin connector. Boards will be available later this year for Omninet and Ethernet network hookups.

Both networks are proven on the PC, with systems available from Corvus Technologies and 3Com Corp. AT&T's vote of confidence in products developed by these firms will bolster their market position.

This low-end system is ideal for engineering and CAD/CAM (computer-aided design and manufacturing) applications, said Casale, or for "small businesses just starting to be civilized by the computer."

AT&T chairman and chief executive officer James E.

Otson was equally ebullient about this market: "The segment we chose for our point of entry is one of the fastest growing parts of the market. We believe...that the clear trend is toward multi-user distributed processing systems rather than stand-alone computers."

PC Interface

Neither the 3B2/300 or the PC Interface will be available until the third quarter of 1984. The PC network cluster will come in three configurations, said Jack M. Scanlon, the technical guru for AT&T's new computer line of business. Users will either link PCs to the AT&T box through the standard RS232 port or via boards available from Omninet and other manufacturers adhering to the Ethernet baseband standard.

The advent of the 3B2 as a network host or controller is good news indeed for PC users. The marketplace has been thirsting for a "brand name" server to augment the less-well-known products from vendors such as Altos and Nestar. Prod-

uct announcements will likely be from third-party or value-added remarketers—such as Corvus and 3Com—rather than AT&T. The PC Interface was developed by Locus Computing Corp. of Santa Monica, California.

Another Ethernet-compatible product is the high-speed 3B Net for connecting the new computers; the coaxial cable network operates at up to 10 megabits per second and over a 1/2-kilometer distance.

AT&T announced two super minicomputers, the bigger 3B20s and the office system 3B5. The 3B20 Model A (\$340,000) is the real biggie, capable of handling 150 users and operating at an estimated 1.5 to 1.8 MIPS—although AT&T officials at the conference called MIPS a less-than-precise comparison for processors, preferring to talk about "throughput."

AT&T's mid-range 3B5 is aimed at the office; the Model 100 (\$57,000) handles 30 users and the Model 200 (\$73,000) doubles that, by simply adding another Model 100.

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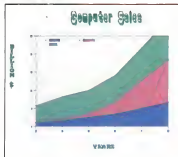
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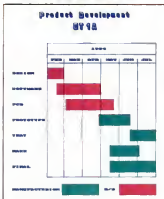
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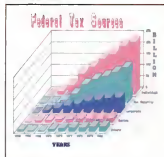
LINE CHARTS STATISTICS



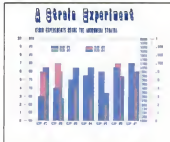
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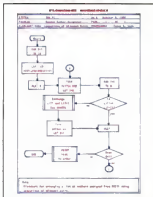
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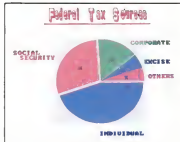
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Ashton-Tate Outlines Framework Of New Integrated Generation

dBASE II patriarch swings at competitors, especially Lotus' Symphony, with powerful package for untapped user market of word and idea workers

BY CONNIE WINKLER AND BILL MACHRONE

NEW YORK—Remember outlining—which Mr. Rasmussen, your seventh grade homeroom teacher, drilled and drilled into you? After all these years, you may now find that outlining can help you with much of the expanding and contracting of ideas, drafts, letters, reports, accounting greensheets, presentations, charts, and generally the work you do today. This is especially true if you're more words than numbers oriented which one estimate says 90 percent of you are.

With its new \$695 *Framework* product, Ashton-Tate is betting that Mr. Rasmussen was right.

A New Package

Framework is what is called an integrated software package; that is, it has word processing, spreadsheet, graphics, data management, and lately, windows—or some combination thereof. But, the new package adds an outlining capability so that writers can use *Framework* to handily put together a term-paper like document—and get the table of contents, or outline, automatically produced at the touch of one button.

Framework includes six functions:

- a frame or window editor and outline control system;
- a word processor;
- a spreadsheet;
- a graph generator;
- a programming language; and
- a database manager.

What makes *Framework* easy to use is its ability to move data freely from one function to another. A spreadsheet cell can contain an entire document. Spreadsheets and graphs can be

pulled into documents. Database information can be graphed directly. And all of the material can be reorganized at any time in outline form.

Almost every *Framework* function is offered on a quick menu (no clunky commands to remember) and users can expand and contract, or add and subtract the number of windows, or frames running on the monochrome screen.

Framework doesn't require a mouse interface; Users (new or experienced) execute functions either through pull-down menus, program function keys, or control keys, Carr said.

"Fast," whispered one experienced user who was watching a demonstration during the recent product announcement. *Framework*'s twice as fast as Lotus Development's *1-2-3*, claims Ashton-Tate, which is primarily known for its sophisticated and complex data base manager *dBASE II*.

With *Framework* comes the Fred programming language

(Fred was the project code name), which allows experienced users and third-parties to tailor their own applications to *Framework*, as many sophisticated users have done with *1-2-3*.

Fred is as complete a language as you could ask for. It is thoroughly modern in conception, and looks decidedly like Pascal or even LISP. Its 140 Command verbs include all of the structural and flow control constructs today's programmers demand. The program also includes functions you can call for all of *Framework*'s editing, graphing, and window management routines. These functions make *Framework* a complete applications development environment that will probably throw off the next great wave of third-party software.

Ashton-Tate's president, David C. Cole, called the Fred language a "software lathe".

Framework itself was written in Assembler primarily by Robert C.M. Carr, one of the

developers of the earliest integrated package, *MBA*, from Context Management. (See "People in the News" below.)

"Fortunately, or unfortunately, human beings don't work linearly," said Carr, while demonstrating the product here. "*Framework* provides the ease and fluidity with which you can work with ideas."

Different programs, such as DOS, can run in one of the program's frames (or windows) allowing the user to access communications links. (Even *1-2-3* could run in one frame.) Additional communications announcements are coming. Cole said. And, without sounding too "gee whiz", *Framework* has other clever features: on the spreadsheet application, for example, when profits fall too low during the computations, the system beeps. *Framework* has 140 different built-in functions, Carr said.

Running *Framework* requires 256K RAM (of which *Framework* takes about 150 K in overhead) and two floppy disk drives.

Word Power

"*Framework* gives the 90 percent of the people who are word, concept, and idea oriented the kind of power that the 10 percent who are number-oriented, the spreadsheet people, are getting today," said Marty Mazner, product manager.

"The cream of the spreadsheet market is gone; there's a much larger market out there," added Cole.

Ashton-Tate describes the target *Framework* user as an analytical manager, new to the PC, who works for a corporation.

(continued)



DOS programs, including communications, can run in one frame or *Framework* slot, which in this case is a special window to the MS-DOS operating system. Ashton-Tate is expected to add DOS applications.

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Framework (continued)

To reach these new users, the Culver City, California, company is getting friendly with dealers ("significantly re-aligning our distribution structure," says Cole) and playing a hunch—that the existing user is the single most important buying influence. Dealers, user group presidents, and third-party developers, were all elaborately introduced at the *Framework* announcement.

War seems to be the appropriate word to describe Ashton-Tate's marketing strategy for *Framework*, which will be shipped July 2.

"It's the same as with a new brand of soap," confessed Mazner. "We aren't going to take any chances breaking through." Within 8 months, 60 percent of the target audience will have seen the *Framework* message in computer trade and business news publications. Mazner is betting.

dBASE Base

Ashton-Tate will also take advantage of the approximately 240,000 customers who have already bought *dBASE II*. Company officials are now on a 22-city tour promoting the product to dealers, user groups, financial investors, and the media.

Framework's likeliest competitors are Business Solutions' *Jack2*, Ovation Technologies' *Ovation*, and Lotus Development's *Symphony*. Microstuf's *Infoscope* has some similarly powerful database functions, but lacks some of the other features that are crucial to the other integrated products. *Jack2*, like *Framework*, integrates its functions smoothly and will produce character graphic charts on the monochrome screen. *Framework*, however, goes further by optimizing its output for the color graphics screen when it is available, even to the point of permitting italic characters (as does Microsoft's *Word*).

Jack2 the first fully-integrated product to hit the market, is reportedly selling word *Ovation* and *Symphony* will be released around the same time as *Framework*, so the competition will be interesting, to say the least.

Adam Osborne Goes Back to the Book

After hard luck with hardware, Osborne takes software to the paperback racks

BY KAREN COOK

BERKELEY, Calif.—The man who brought the world the Osborne Personal Computer, the first portable, now hopes to bring software to the masses. Adam Osborne, who also founded and then profitably sold a computer book company, is going back to his beginnings. Osborne plans to sell software much as publishers sell mass market books with a new company (for once not named after its creator), Paperback Software International.

As the name implies, Osborne's software will be bound into paperback books. In addition to computer stores and office supply centers, Osborne hopes to peddle stacks of his product through bookstores—

which up until now have not been successful in the software business. Waldenbooks and B. Dalton bookstores have already agreed to carry Paperback Software, Osborne says.

Rather than starting his own software development team, Osborne intends to repackaging existing products or products already in development. Paperback Software's 30 or so programs will be identically packaged with similar manuals and commands, so users of one package will have a headstart on using the whole library.

Potential customers will be able to browse through book-style documentation before they buy, so no retailer demonstrations will be required. "All the

sales people will have to do is point out where the sales racks are," Osborne says enthusiastically.

To prevent theft, "the disks will be put in such a way that they will make a lot of noise if anyone tried to take them out," says John Brockman, a leading agent for software authors.

The new company will be financed through a series of "expense" partnerships, with the total investment in each partnership about \$2 million dollars. Investors who contribute to five or six partnerships will have a better chance of backing a winning product, Osborne explains.

Software companies contribute products, rather than money, to the partnerships. They get paid consultant fees for converting their products to Paperback Software style in the first year, then a 20 percent royalty on all sales. At the end of the third year, they must sell their rights to the program to Paperback Software—for a price determined on a sliding scale of revenues. (Investors, who have taken tax write offs and gotten a percent of revenues, are also brought out at the end of three years.)

So far, three software companies have already agreed to supply Paperback Software with products, and Osborne doesn't expect to have many difficulties in recruiting the 30 companies he plans to distribute for. Most small companies don't have enough money or marketing expertise to make big profits on a single product, so they are receptive to distribution deals, Osborne says.

Furthermore, small companies looking for steady income won't find happiness with book publishers who are also publishing software. Although large publishers have marketing clout, he says, book-style royalties are too little to live on. "If most book authors divided their royalties by the hours spent writing their books, they'd find they'd make more money babysitting," Osborne explains.

Will the amazing Osborne succeed this time? "If anyone can proselytize and make a market, he can," Brockman says.

If It Works for Calvins, How about MultiMate?

This won the vote of the *PC Magazine* staff's favorite ad of the month. No more SoftWord Systems...the company now calls itself MultiMate International. Changing her name worked for Joan Crawford—will it work for MultiMate International?

This advertisement's approach reminds us of a secret revealed by Calvin Klein in a recent *Playboy* interview: "The only way to advertise is by not focusing on the product. Some people feel that what we're doing makes no sense, that it's just a waste of money. But it's working. My attitude is 'If you want to sell jeans, don't talk about them.'"

—Jane Mintzer



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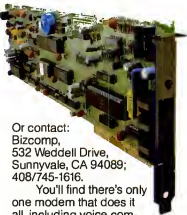
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CIRCLE 129 ON READER SERVICE CARD

New Products Launched At West Coast Faire

Corona, Dimension, and Colby display compatibles, and Key Tronics breeds mouse with keyboard

BY JAMES LANGDELL

SAN FRANCISCO—The West Coast Computer Faire started 8 years ago, long before PCs got down to serious business. Traditionally, this event is more a festival for micro enthusiasts than an industry show. Even so, at this spring's Faire—the ninth—several companies launched interesting new products, and *PC Magazine* got a better look at others already on their way.

Mouse Meets Keyboard

Key Tronic, of Spokane, Washington, will offer an intelligent keyboard that handles voice, mouse, and optical character reader input. These optional input devices are coordinated by processor and memory circuits in the keyboard, which passes on all input to the computer itself.

The voice control system, which includes a microphone headset and a foot pedal, will be available this summer. A user can record a recognition pattern for numerous spoken words in the memory packed into the new intelligent keyboard. To activate this speech input system, the user holds down the foot pedal and speaks into the microphone. The keyboard recognizes the spoken word and outputs the set of characters and commands associated with the word in the keyboard's memory. The output comes to the computer as if it had been keyed in; no additional interface is added at the computer end.

Later this year Key Tronic will introduce a mouse, with a strain gauge system that detects motion to direct the cursor. It uses no moving parts, such as a mechanical ball or optical sensor. The mouse can be connected directly to the computer through a RS-232 port or

through the keyboard, in which case the mouse input can be processed or buffered by the keyboard's built-in processor and memory.

Hard and Portable

Corona Data Systems now has a 10-megabyte hard disk portable computer, the PPCXT, which weighs 33 pounds and costs \$4,895, about \$100 less than leader Compaq. The PPCXT includes a half-height Cojito hard disk and a floppy disk drive with a protective feature that sets the drive head in a "parking zone" whenever power is turned off.

The portable's 9-inch amber monitor has crisp text and graphics, thanks to the Corona's high vertical resolution: 325 rows, versus the IBM PC's 200. Soon, Corona is expected to have an even finer display with 640-by-400 resolution—doubling IBM's vertical density (and simplifying the conversion of graphics).

Software bundled with the Corona portable includes *Multimate*, GW-BASIC, and MS-DOS 2.0, which Corona only recently updated. "Offering MS-DOS 2.0 wasn't a high priority for us," says Robert Harp, Corona's founder and chairman. "We developed a hard-disk ver-

sion of MS-DOS 1.25 by June 1982, well before Microsoft completed 2.0. And, aside from letting you use a hard disk, MS-DOS 2.0 didn't offer much more."

Dimension on a Truck

Can a single computer find happiness by emulating not only the IBM PC, but the Apple II and CP/M-based machines as well? This question was raised by the Dimension, a new 32-bit computer by Micro Craft Corp., which uses three co-processor boards to emulate a number of personal computers. Its emulation software can even reproduce, for example, the effect of setting DIP switches within the IBM PC, according to the Dallas manufacturer.

Dimension's image as the "machine of a thousand faces" drew a lot of attention from Faire goers, but Micro Craft considers the emulation powers of its 32-bit computer to be just gravy. "This is a transition machine," says Mark Belcher of Micro Craft. He wouldn't recommend it to somebody who simply wanted to use IBM PC or Apple or CP/M software. "It's a machine for someone who wants to move up to a 32-bit system, but needs to keep running software and files from an older ma-

chine."

In the machine's native mode, the Dimension's primary microprocessor, a 32-bit Motorola 68000, runs CP/M-68K. Digital Research's 32-bit operating system, Little software is available yet that runs in this pure 32-bit mode, aside from several languages and utilities, but UNIX should be available soon. Micro Craft, after extensive testing under Dimension's emulation modes, claims its machine runs an impressive list of functional 8-bit and 16-bit programs, even though Micro Craft admits the IBM emulation mode can't use such software as IBM's APL and Pascal or Microsoft's Word.

The Dimension computer has been exhibited previously, but at the West Coast Computer Faire it was finally available to paying customers: For \$4,995 you could pick up a system, including three emulation boards, from a truck parked outside of San Francisco's Civic Auditorium.

Colby Camouflaged

A computer in a camouflaged green-and-khaki hard plastic case caught visitors' eyes at Colby Computer's booth. At last! A PC-compatible that isn't beige or black. Chuck Colby, founder of this Mountain View, California company, explained that the Army plans to purchase about 100,000 portable computers for field use this year. His company prepared this new model in an attempt to win part of the massive order.

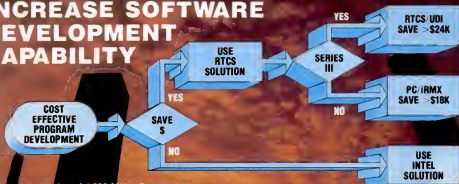
This new ruggedized Colby computer can run 20 minutes without external power, or be powered by a car battery. If a camouflage finish makes a computer fulfill your military needs (continued)



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AST-PCnet II Local Area Network

WordStar's New Checker Finds the Right Word

CorrectStar, a 16-bit successor to SpellStar, is ready to make suggestions

BY JAMES LANGDELL

SAN FRANCISCO—MicroPro had something to celebrate about when it announced its new *CorrectStar* software. At a breakfast press conference, just before the doors opened at the West Coast Computer Faire, the company's founder was on hand.

"This is my first public appearance as Chairman Emeritus of MicroPro, and the first time I've appeared as a large stockholder in a publicly held company. Also, this is my first public appearance since having a heart attack in January," said 49-year-old Seymour Rubenstein. "I'm very happy to be here today."

The day before, MicroPro

successfully concluded its first public stock offering, selling 2.2 million shares at \$10.50 each. This gives the San Rafael, California company new funds to build on the success of *WordStar*, which been a hard act for its maker to top with any new product. MicroPro claims *WordStar* has worldwide sales of over a million copies, in nine languages.

CorrectStar is the MicroPro's latest product for enhancing *WordStar*. It's a spelling checker with a 65,000-word dictionary on disk, based on the *American Heritage Dictionary*. The program also loads the most common 9,000 words into RAM for faster operation, since this set of

words accounts for 88 percent of the words in a typical document. Users can also include a personal dictionary with up to 1,500 words.

"With *CorrectStar*," Rubenstein claimed, "people who type and write only approximately can spell correctly with confidence. It lets you use the words that come to your head, without having to look them up."

How Does It Work?

CorrectStar doesn't just flag words that might be misspelled; unlike MicroPro's *SpellStar*, it suggests the correct spelling of each word. The program often finds a desired word that lurks behind graphic errors, such as letters that are repeated (*thhe*) or transposed (*hte*). It sometimes guesses the word you want if you type a phonetic equivalent. For example, MicroPro demonstrated that its program can suggest *ocean* in response to the soundalike *oshan*. You can insert any word the program suggests by making a single keystroke.

If none of the suggested words are the one you want, or you know what's right before a suggestion appears, you can break in to type the right word on the spot before going ahead to the next "suspect word." When you want pause to do more extensive editing, pressing Ctrl-U stops the spelling checker and puts the document directly into *WordStar*.

The Dictionary's Source

MicroPro developed *CorrectStar* in collaboration with Houghton Mifflin Company, the 150-year-old Boston-based publisher of the *American Heritage Dictionary*, the first dictionary to be compiled with the aid of a computer.

Howard Webber, publisher for Houghton Mifflin's reference division, said that Dr. Henry Kucera of Brown University headed a research team for *CorrectStar*.

Houghton Mifflin also was involved in developing *SpellStar* and IBM's *Word Proof*. (In an earlier review, "Warding Off Evil Spells" in PC, Volume 2 Number 7, Stephen Manes found *Word Proof* to be an excellent and inexpensive spelling checker/corrector program with only one serious flaw: He wished it could be used with *WordStar*.)

CorrectStar is already available for the IBM PC, Tandy 2000, TI Professional, and DEC Rainbow; MicroPro also sells a generic MS-DOS version. Separate versions are available for American or British spelling (if you wonder which you have, try typing the word *colour*). To run *WordStar* and *CorrectStar* simultaneously, a system must have at least 192K RAM and either two double-sided disk drives or a hard disk. These hefty requirements put MicroPro's new product out of the reach of modest IBM PCs and all 8-bit machines. For any of these machines, *SpellStar* will still be available.

The list price of *CorrectStar* is \$195. It's also available as part of *WordStar Professional* (\$695), which includes *WordStar*, *Mail Merge*, and *StarIndex*, or in the Professional Options Pack (\$395). ■

Faire Products (continued)

(or fantasies), you'd be in the market for another Colby option: a special outer case that lets you drop your computer out of a helicopter into water—and it keeps on processing.

In addition to making its own line of IBM-compatible computers, Colby repackages real IBM computers in a variety of ways—as cash registers, for example.

PCjr owners now can have their computer built into a portable case, called the Peanut Shell (\$599), with a built-in 9-inch screen and a Colby keyboard. This portable unit weighs a mere 19 pounds. A second disk drive (\$400) and a forthcoming multifunction board can be added to the Peanut Shell. Colby will soon be offering a similar consolidated package for the Apple Macintosh, including the keyboard, and second disk drive. A Colby keyboard, reconfigured for the PCjr, is now available for \$249. "All we had to do to our PC replacement keyboard was put

on a different ROM chip and cable," says Colby.

Making Book on Disks

At the well-attended Faire, Dyan Corporation's booth spread the word on Dyan Series Software: popular programs repackaged on Dyan's new 3½-inch Flex Diskettes. Dyan's edition of *SuperCalc* had a newly printed manual, with a "10 Minute Start" section that will be in all the packages Dyan revises.

"A poll of users showed they typically use only 10 to 15 percent of the features in a program," says Bob Moody of Dyan Series Software. "We move those features up to the front of the manual so users can learn them quickly."

Dyan is now promoting its new 3½-inch disks by offering 200 popular programs in its small disk format. At the Faire, Dyan showed IBM PCs with pairs of Tabur 3½-inch drives (sold under the Concorde name). Until smaller-than-ever IBM-compatible portable com-

puters can be built around the smaller drives, however, the only reason PC owners might switch to 3½-inch disks is to put Dyan's improved manuals on their shelves.

Faire Pickings

The Faire was home to other interesting new products.

- The Quadjet color ink jet printer, \$895, is the newest offering from Quadram Corp., of Norcross, Georgia. It's small—less than 16-by-12 inches—and prints seven colors, along with adequate character text.

- For \$49.95, the *Turbo Pascal* compiler from Borland International of Scotts Valley, California, requires only 33K of memory and runs on the PCjr as well as on other IBM personal computers.

- With the *Multi-Job* packages from B&L Computer Consultants, of Boise, Idaho your PC can do several tasks at once. The *Multi-Job* software and terminals let several PC-DOS programs run simultaneously on one PC. ■

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Eagle Computer Turns Red In the Face of Big Blue

Eagle says BIOS revision problems caused a big loss and delayed its new Turbo PC

The copyright infringement suits IBM brought against its competitors early this year have had one unexpected result: Eagle Computer, Inc., of Los Gatos, California, lost between \$7 and \$9 million in the quarter ending March 30.

Eagle blamed the losses largely on complications in revising the BIOS (Basic Input-Output System) chip on its IBM-compatible models. In its settlement with IBM, Eagle agreed to halt shipments of computers with the contested chip after March 6. Unexpectedly, Eagle engineers were unable to revise the BIOS in time to meet that deadline, and shipments stopped for 2 weeks.

Among the computers that didn't get shipped was a new model, an 8086-based, IBM-compatible desktop model called the Turbo PC. Eagle delayed official introduction of the new machine until the BIOS problems were resolved.

The 2-week halt in deliveries caused some unrest among Eagle dealers. "A few dealers and distributors took a 'wait and see' attitude before ordering more product from us, so sales did not follow the expected pattern," explained Frank Weikel, director of corporate communications for Eagle.

Weikel predicts that Eagle sales and dealer confidence will rise in the fourth quarter. In a move to spur retail sales, Eagle recently announced price cuts of

around 10 percent for most of its compatibles.

In the past, some dealers have complained about delayed shipments and high prices for Eagle machines, but distributors contacted by *PC Magazine* were waiting patiently for Eagle to regain its corporate stride.

"We had an inventory of Eagles with the old BIOS, which we can continue to sell, and sales are starting to pick up. The price cuts will help," said Richard Justman of Excel Distributing, Inc., in Plainview, New York, who had not received any new shipments from Eagle.

"I think we all knew that some of the new compatibles were too compatible, so to speak, but nobody expected IBM to take that strong a position so quickly," said Jerry Bronstein, president of BMD Development, a Manhattan distributor. "I haven't cancelled any orders; I'm just waiting for new product," he said.

Corona Data Systems, of Westlake Village, California, was also under legal orders to rework its BIOS. Corona says the new BIOS was shipped on time. "Our people worked hard and long on this, and they were proud as peacocks when they reached a new BIOS a week early," commented director of corporate communications Kenn Morris, who offered no estimate of what the revision had cost Corona. ■



Sperry's \$40,000 Micro: Born to Run MAPPER

BLUE BELL, Penn.—"Choose the software, then the hardware," is a computer-age maxim. Now, if your first choice of software is Sperry Corp.'s MAPPER, a versatile program written for Sperry mainframes, you can get a microcomputer that's born to run MAPPER.

MAPPER is an existing popular computer language with simple English and visual commands for business users to organize and manipulate information in far less time than through conventional programming languages.

Sperry developed MAPPER about 12 years ago for its internal use. For the past 2 years, MAPPER has been used widely on Sperry computers, including MAPPER 10 dedicated mainframes.

Now Sperry offers the MAPPER 5, a microcomputer that runs MAPPER software. The MAPPER 5 processor unit is built around a 16-bit Motorola 68010 chip, with a 5½-inch disk drive. There's also a separate

cabinet, with hard disks and a streaming tape backup system.

The MAPPER 5 supports up to 30 simultaneous processes and 16 separate terminals, which can be Sperry UTS display stations, Sperry Personal Computers (IBM-compatible), or even IBM PCs. The MAPPER 5 also communicates with Sperry mainframes. This fall, Sperry will offer MAPPER 6, a similar system that can be linked to IBM mainframes.

The price of a minimal system, with three color UTS terminals, is about \$40,000. Larger configurations have an average price of \$10,000 per workstation. As hardware alone, that's expensive for a desktop computer. But, as a Sperry vice president, Tom McCaffrey, put it, "the MAPPER 5 is a system, not a personal computer." At this price, Sperry's new system can put the power of MAPPER in the reach of far more users who might have voted for the software, but would veto a mainframe. ■

Chip Display Begins National Tour

"Chips and Changes," an exhibit that explores the technology of the computer chip, has just packed its bag at the San Francisco Exploratorium and is going on the road. The exhibit, which explores the influence of microelectronics on people's daily lives, is off on a 2-year national museum tour.

Organized by the Association of Science and Technology Centers, the exhibit combines hands-on participation with interactive computer displays, robots, historical objects, pictures, and audiovisual presentations of microelectronic products and services.

Visitors are led through the development of microprocessor technology and the manufacture of chips and software.

Sheila Grinnell, project director for the exhibit, says "the show doesn't make predictions for the future, but rather, it does tell us where the development of chips stands today."

For a complete schedule of exhibit dates and locations, contact the ASTC, 1413 K St., N.W., Washington, DC, 20005-3405, (202) 452-0655. Supplementary lectures, courses, films, and publications will be offered by many of the museums. —Jane Mintzer

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New Micro Ideas Are The Talk of the Faire

Hints of new hardware and software dropped in panels and "All-Star" talks at West Coast Computer Faire

BY JAMES LANGDELL

SAN FRANCISCO—The West Coast Computer Faire isn't an industry-wide trade extravaganza like COMDEX, where digital-dramas come to a climax—it's just a regional show. But this region includes Silicon Valley, so many key players and pioneers in the business appeared at the Faire and talked about new moves on their home turf.

More Light on Windows

For example, at a forum on "User Interface/Operating Environments," John Butler of Microsoft hinted at changes in *Windows*. He said that the demonstration software he was using was over 4 months old, and explained that the current version is quite different.

Butler says, "Now that we can talk to the team that was working on software for the Macintosh, we're working on making it possible to write applications programs that will look much the same when run with *Windows* as on the Macintosh." One change is that Microsoft's *Windows* won't be tied to using the character set defined in IBM's ROM, but will be able to produce different type styles.

Although *Windows* was originally supposed to appear in March, Butler says Microsoft plans to release the software in May.

Micro Stars

One highlight at the Faire was a series of talks by 18 PC industry leaders, the Microcomputer All-Stars. Most speakers spent little time reminiscing, and moved on to their new ventures and new ideas (and, unfortunately, several All-Stars rung changes on the "Where's the

beef?" theme).

The opening speaker, Bill Gates, chairman of Microsoft, did look back to the first generation of microcomputers such as the Altair. That machine had an 8080 processor, 7K of memory, and ran BASIC. Gates says, "The computers themselves haven't changed all that much since then...but the way solutions get delivered to end users have changed much more."

"The software industry," Gates observed, "used to be a bottleneck stopping use of the greater power of the chips." Now, he says, the greatest gaps in microcomputer development are in distributing software and educating users. "People used to think software making and support would be separate businesses. Many manufacturers just refer users' questions back to their dealers."

Gates says Microsoft has tried to deliver information directly to customers, but "we still only get back 20 percent of our software registration cards, even when we offer free newsletters." His company's new venture, Microsoft Press, will provide a greater range of training material for users of Microsoft's software and other products.

Kildall's Video Ideas

"Video is going to play more of a part in our lives—especially with computers," claims Gary Kildall, creator of CP/M and head of Digital Research Inc. In his All-Star stand, Kildall shared his excitement over the potential for personal computers to interact with random-access videodisks. Showing simplified views of current interactive videodisks, he suggested

ways they could be enhanced with more extensive computer interaction. "It's like when the Gutenberg press came along. There are a lot of people saying, 'Hey! I have an idea for what you can do with that new thing.'"

The first offering from Digital Research that links computers and videodisks will be an update of *Dr. Logo* that adds three videodisk primitives to the language: *VDPIQ*, *VDPSTAT*, and *VDPFLAG*. Kildall says it took 90 minutes to write a *Dr. Logo* program that turned a videodisk of *Flashdance* into what he calls "Interactive *Flashdance*." His program treats the movie as a database, and lets him write commands that find and display all the scenes with a certain character or the dance numbers.

Digital Research is also working on a standardized Videodisk Interface Manager (VIM), the videodisk equivalent of a disk operating system. Kildall says VIM should be ready in 1985. By then, he claims, a minimum system with videodisk player, interface, software, and an inexpensive computer (like the Commodore 64) could cost only \$800.

Harp's Dream Network

Robert Harp, founder of Corona Data Systems, spoke about multi-user systems and pointed out deficiencies of the current PC local area networks and of the older time-sharing systems that use dumb terminals and a large computer. He says UNIX isn't the best solution for linking personal computers: "That's an operating system with a lot of complicated processes that switch several users in and out

of one big, expensive processor," says Harp. "Now that processor chips are inexpensive, you can let each station use its own processor most of the time, then connect them with much simpler software." Harp believes the multi-user version of MS-DOS, which he expects soon, will be better than UNIX for networks of PCs.

Harp described a multi-user system he feels would be a good alternative in the near future—a closely coupled local area network. "Put all the processors, main memory, and video memory in one central box, which can be 300 feet away, so users only have the keyboards and monitors on their desks. When people start using PCs, their offices have to get larger—and that's more expensive than the hardware."

Harp stressed that the closely coupled local area network was only a hypothetical product—"This isn't a product announcement." However, the slides used in Harp's presentation described this "hypothetical product" in great detail, down to the style of swivel mount used with its desktop monitors.

Big Blue and Big Mac

This West Coast Computer Faire had more of a suit-and-tie atmosphere than in previous years, a sign of the higher stakes in the microcomputer industry, but also of the new management of the Faire, which Prentice-Hall acquired last year from founder Jim Warren.

IBM and Apple each occupied a lot of real estate in the Faire's exhibit halls. Neither introduced new products that week, but both companies gave visitors a chance to get their hands on the latest machines. At one end of a hallway was a room filled with IBM PCs; at the other end, a room full of Macintoshes. You usually could walk right in to try out a PC, but there was always a line in front of the MacRoom.

Apple also brought along the most striking object at the Faire, an attraction worthy of the best carnival freak shows: a 12-foot-tall Macintosh, built to scale around a giant projection screen.

Calendar of Events

DATE	EVENT	COMMENT	LOCATION	CONTACT
May 22-25	COMDEX/Spring	Hardware, software, and accessories for dealers and retailers.	Georgia World Congress, Atlanta Apparel Mart, and Atlanta Merchandise Mart Atlanta, GA	The Interface Group 300 First Ave. Needham, MA 02194 (800) 325-3300 (617) 449-6000
May 22-26	MICRO-EXPO	International hardware and software trade show.	Palais des Congres Paris, France	MICRO-EXPO 2344 Sixth St. Berkeley, CA 94710 (800) 848-8233 (415) 227-2346
June 12-14	Advanced Manufacturing Systems Exposition & Conference	Information systems and automated production systems.	McCormick Place Chicago, IL	AMS '84 708 Third Ave. New York, NY 10017
June 13-15	Use of Microcomputers in Occupational Safety and Health	Seminars on how to select and use micros for safety and health data collection, analysis, and retrieval.	University of Washington Seattle, WA	University of Washington Seattle, WA 98195 (206) 543-1069
June 14-17	Cincinnati Computer Showcase Expo	Hardware and software.	Cincinnati Civic Center Cincinnati, OH	The Interface Group See above
June 15-17	Computerfest '84	Exhibits, seminars, and hardware trading.	Dayton Convention Center Dayton, OH	Mid West Affiliation of Computer Clubs P.O. Box 24505 Dayton, OH 45424
June 18-21	The National Database and 4th Generation Language Symposia	Product-oriented discussions and seminars.	Stouffer's Inn of Westchester White Plains, NY	Software Institute of America 8 Windsor St. Andover, MA 01810
June 20-22	Project Planning, Scheduling & Control Using PCs	Hands-on workshops to help upgrade productivity and effectiveness with the help of PCs.	AMA Management Center Washington, DC	American Management Association P.O. Box 319 Saranac Lake, NY 12983 (518) 891-0065
June 21-24	Boston Computer Showcase Expo	Hardware and software.	Hynes Auditorium Boston, MA	The Interface Group See above
June 25-27	Personal Computers & Networking	Seminars for developing strategies for using and selecting PCs.	Detroit-Plymouth Hilton Inn Plymouth, MI	Center For Advanced Professional Education 1820 E. Garry St. Suite 110 Santa Ana, CA 92705 (714) 261-0240
June 28-July 1	Milwaukee Computer Showcase Expo	Hardware and software.	MECCA Milwaukee, WI	The Interface Group See above

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Microcomputers: Use And Misuse in Business

Price Waterhouse handbook helps companies set controls for personal computers.

The accounting firm of Price Waterhouse is well-known for keeping secrets—most notably the names of the winners of the Academy Awards—but lately they've begun sharing a lot of what they know about computer systems.

They've just released a second handbook on the subject—called "Microcomputers: Their Use and Misuse in Your Business." This follows last spring's release "Minicomputers and

Control," and was prompted by the demand for micros, said George Fruehan, a marketing executive for Price Waterhouse.

Because the distinctions between minis, micros and mainframes are blurring, more small businesses are considering micros as the most economical way to make their first foray into computers, he explained.

The handbook is written without jargon—in fact it avoids it to the point of aridity.

It's a straightforward primer on microcomputers and even includes a glossary of terms from "byte" to "nybble" (four bits).

The book warns of today's "casual operating environment" and the informality with which most users approach the machines. It reminds businesses that micros are "real" computers and that strict controls are necessary when they depend on micros. Price Waterhouse says that, while the sheer mystery of how Electronic Data Processing systems worked once safeguarded mainframe computer systems, the friendly personal computers now make understanding—and illicit use—of the systems much easier.

The booklet is free through any Price Waterhouse office. ■

Dr. Logo Calls Again

Digital Research is readying a new, more compact, and probably less expensive version of the LOGO language that may be marketed as soon as May. Rather than replacing the current *Dr. Logo* offering, however, the new LOGO will take up the *Dr. Logo* banner while the old version is promoted to *Advanced Dr. Logo*.

In many ways the new *Dr. Logo* will improve upon its older namesake. Smaller and requiring less memory than the current versions' 192K, the target size of the new *Dr. Logo* is 128K—which means that it will run on an enhanced PCjr.

The new *Dr. Logo* will be able to make use of the 8087 math coprocessor in the PC, for roughly a tenfold increase in the speed of turtle graphics. Further, the new LOGO will be easier to get along with—it will not be case-sensitive (the current *Dr. Logo* requires all procedures be typed in lower case), and it will be compatible with DOS files, with primitives to open and close files, set screen modes, and display directory information. (The current *Dr. Logo* runs under its own operating system, a version of CP/M-86.)

Digital Research's goal is to make a more compact LOGO, rather than a more powerful one. When the new *Dr. Logo* becomes available, users who step up to *Advanced Dr. Logo* (which is really the current *Dr. Logo*) will add more mathematics, editing, packaging, and debugging functions, an on-line help facility, and a larger vocabulary.

The new Digital Research LOGO will probably bear a strong resemblance to the *PC Logo* marketed by Harvard Associates in Somerville, Massachusetts, and for a very good reason. According to one source, the actual programming for the new *Dr. Logo* will be handled by Gold Hill Computers, Inc., the same company that wrote *PC Logo*. ■

A Pleasure Cylinder For Xanadu's PC

What if being beige isn't enough to keep a PC from clashing with the interior design of your home or office? Would you rather see a shiny, chrome cylinder as part of the decor in your living space?

Now there's something called the "Executive Work Station," which its manufacturer says is "designed to conceal personal computer components and accessories in a compact sleek storage unit." It's part of the C. Jeré collection and was inspired by the "Master Sculptor" of Artisan House, Inc., studios (1775 Glendale Blvd., Los Angeles, CA 90026). The unit with a satin-brass finish costs \$1,595, while the brown-vinyl model costs only \$1,495.

The 200-pound steel-reinforced cylinder is home for a microcomputer (IBM or Apple) and its monitor. When the doors open, you can fold out a keyboard, printer, and even a wire basket for printer paper. There's also a storage area for boxes of disks. After a vigorous session of executive work, you can only hope that the peripherals will fit back inside again.

The cabinet looks right at home on display at Xanadu, a futuristic house in Orlando, Florida. The company has a

meaningless slogan that attempts to convey this ultra-modern tone: "It is what you'd expect to find in the pace-setting future."


When we saw the chrome cylinder, our thoughts also turned to science fiction. It reminded us of the Orgasmatron in the futuristic Woody Allen film, *Sleeper*, but the Executive

Work Station doesn't seem ready to offer users any warm, euphoric sensations. It's 29 inches wide and only 50 inches high—too much of a squeeze for human comfort, to say nothing of boundless, guiltless pleasure. It's the right size for microcomputers, though. We wonder what fun they're having that we're missing. ■



Micro-to-mainframe:

Before you settle for a simplistic solution, ask a few serious questions.



Choosing a micro-to-mainframe communications system is no game.

So before you toy around with "easy" solutions, ask some serious questions.

Will this product support full IBM Terminal Emulation?

Make sure the system can emulate remote batch and interactive IBM terminal systems.

Does the company offer a variety of products?

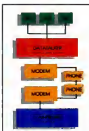
You should have your choice of stand-alone front-end processors, IBM PC or XT boards, or an OEM board. All ready to run on the most popular operating systems.

Can I get fast answers to my questions?

Insist on toll-free access to qualified service personnel before and after the sale.

What if I need a quick analysis of a problem?

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Suppose something goes wrong with the unit?

The company should offer a 30 day money-back guarantee and a 12 month warranty that includes a free replacement unit.

What about future product development?

Make sure the products you're going to need soon will be available soon.

Who am I dealing with anyway?

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People in the News: Robert M. Carr

In searching for a new integrated software metaphor, Rob Carr returned to a hierarchical framework from his early sojourn at Xerox's Palo Alto Research Center

BY CONNIE WINKLER

NEW YORK—Rob Carr thinks like the Dewey Decimal System—and his thoughts were nurtured at the temple of user-friendly technology, Xerox's Palo Alto Research Center (PARC).

Carr is the latest PARC disciple to make it big in the microcomputer industry's integrated software sweepstakes.

Call Him "Fred"

More so than anyone, Carr has the right to be nicknamed "Fred"—once the code name for *Framework*, Ashton-Tate's plunge into the competitive, but lucrative, integrated software market. Of course, *Framework* includes all the capabilities—word processing, spreadsheet, graph generator, database manager, windows, and programming language—now standard for these multifunction packages.

But what makes *Framework* interesting is that it rejects the "toilet paper roll" view of applications, popularized by spreadsheets, where a user has to tediously scroll through pages and pages of data to get to a specific piece of information.

Better Metaphor

Carr suspected there had to be something better than the toilet paper approach—some metaphor for systems better than the spreadsheet model that most systems have been designed around.

"I've always been fascinated with outlines and hierarchies," said Carr, who confesses that while growing up in Los Angeles he always wanted to be a creative writer. Carr started out in journalism as an undergraduate.

There's a daily life experience with outlines, he argues. "It's one of the things we are very familiar with." Hierarchies

can unscramble library and card catalogs and are ever-present in books in the table of contents. An outline is an extremely handy and useful way of dealing with any body of information.

While Carr may have appreciated outlining in junior high school, he forgot about it until early 1982 when he was called back into Context Management Systems to port its *MBA* software to the IBM PC. (*MBA* was one of the first—and perhaps the first—integrated packages.)

"I did a lot of thinking while porting it," he recalls. "By happenstance I experienced a train of thought that ultimately helped me come up with *Fred*."

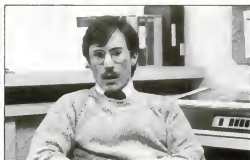
During the year and one-half he was at PARC in the Advanced Systems department, Carr also pursued his masters degree in computer science at Stanford University. At PARC he was mostly involved with the integrated database portion of a sophisticated hardware system, much like Xerox's Star.

While there, Carr worked with at least three of his Stanford professors. "I was a small fish in a big pond, but it was a dream spot for me to learn from."

But he still hadn't been converted. "I hadn't yet found out what fun work could be when you're able to be creative." After PARC he gave away his computer books and struck out for Mexico.

Back in the U.S. in 1980, he found himself working in a basement that belonged to the president of Context Management Systems. Carr was working on *MBA*. There were just five other people on board the fledgling company—and he was hooked.

"I had more fun working than ever before," he remembers. "I loved programming more than ever. With the startup I had more



responsibility; there was the classic energy and excitement of a new venture."

Intense Ideas

With the money and a working high from *MBA*, Carr set out for Europe. This time, when he returned, he had enough money to live on for half a year and an IBM PC. He found an apartment in San Francisco and went to work. It was then early 1983. "I wanted to be able to go off and explore some of my ideas," he said. "It was the most creative time of my life. I had never programmed in assembler before—I wanted to have a system that was very fast, but required as little money as possible."

Several early users have found that *Framework* makes the PC look good, apparently heightening the PC's performance. "Mostly that reflects the frames technology that I have developed, a new way of organizing memory," said Carr. It's an implementation that takes advantage of the Intel 8088 processor, he added.

Frames (which appear as windows on the monitor and are so designated in other products) are also Carr's reference point for structurally storing information within the program.

And, despite Carr's PARC stewardship, *Framework* doesn't

use a mouse to enhance the user interface. "We feel good about that," said Carr. "We wanted to keep the hardware configuration to a minimum. There was a lot of unrealized potential in the keyboard and we wanted to keep the hands free."

Ashton-Tate may later support the mouse as an option for *Framework*.

By mid-1983 Carr had teamed up with Martin Mazner, the former vice president of marketing at Context whose immediate reaction to *Fred* was: "Robert, do you realize what you have?"

To the Forefront

Together Mazner and Carr incorporated Forefront Corp. They then had two choices: seek venture capital to launch *Fred* by themselves, or team up with an existing company. "We went to Ashton-Tate and found a match," said Carr.

Forefront remains a separate developmental company, with 15 percent equity and a buy out option after 3 years held by Ashton-Tate. "Our lawyers got a lot of money for figuring this one out," laughs Carr.

Ashton-Tate is now betting millions in promotion and advertising alone, that Rob Carr is not the only one who thinks like the Library of Congress. ■

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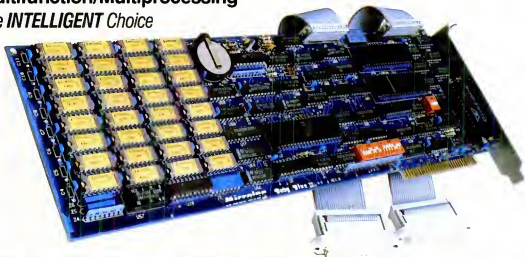
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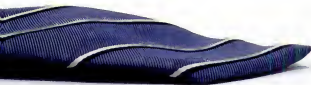
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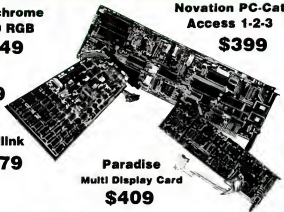


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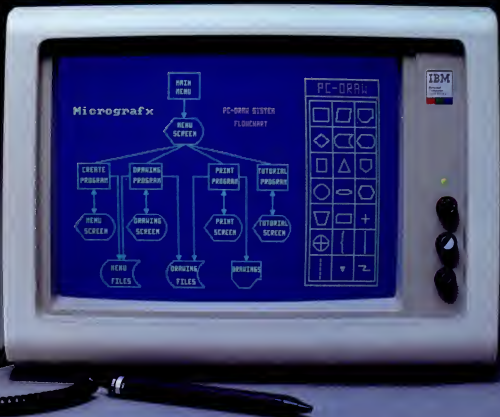
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Fact or Fiction?

A battle is taking place in the UNIX marketplace, and the lines could not be drawn less clearly. Machrone sorts out the facts from the fictions and asks whether we are ready for UNIX.

Another one of those big battles is in the works again. As usual, IBM is right in the thick of it.

This time, the arena is operating systems, and the combatants are IBM and AT&T. The object is dominance of the UNIX marketplace. Digital Research and Microsoft are, depending on your point of view, allies or pawns in the struggle.

The battle lines, however, could not be less clear. The plot is as thick and convoluted as any novel by Ludlum or Trevanian. The principals trade technology, license agreements, and who knows what else. Then they slug it out in the marketplace. The end users, meanwhile, are at a loss as to what the whole thing is about.

Sorting Out the Facts

Fact: AT&T developed UNIX for use as an in-house operating system with one purpose: to make development of programs as easy as possible for teams of programmers. To this end, the system design is elegantly simple, and the command structure requires you to enter as few keystrokes as possible, whether they are mnemonic or not.

Fact: The proliferation of UNIX, through the universities, was almost accidental at first. Back then, UNIX was as heavily dependent on the characteristics of its terminals and other peripherals as any other operating system. Its freshness and originality had more to do with its growth

than its portability.

Fact: UNIX's portability, based on its being the first operating system written in a high-level language, was not the key to its migration to so many machines. It was



Bill Machrone

merely the means to an end.

Fiction: The UNIX operating system is so efficient that a quick recompile of the code and a few routines in a target machine's assembly language is all that's required for a good port. One of the reasons that AT&T's first micro, the 3B2, is so late getting to market is that the company has busily been recoding significant portions of the kernel in assembler, to improve performance. This, remember, is running on the 32-bit microchip that AT&T designed for efficiency in executing C.

Fact: The vaunted UNIX shell is just as dumb and unfriendly as the command processor in any other operating system. The real joy is that it is so easy to replace with something better or more germane to a given user's task. Like the elephant and the blind man, UNIX's appearance is dependent on your point of view.

Fact: The Berkeley port to the VAX and the addition of important features like termcap and the visual editor (vi) had as much to do with UNIX's burgeoning popularity as anything that Bell Labs did.

Fact: Microsoft's XENIX, a hybrid of Version 7 and Berkeley 4.1 features, has been ported to a huge number of machines.

Fact: The best port of XENIX was not done by Microsoft, but by Altos for its superlative 586 (5-user 8086) machine. This port includes a shell compiler that allows the system installer to create simple, menu-driven shell programs, tailored to the user's application. It has probably done more than any other version of UNIX to convince end users that there's nothing to be afraid of.

Scouring the Marketplace

Fact: AT&T is not dumb. It has incorporated all the best from the Berkeley versions of UNIX into its latest release of System V. Further, the folks at the Labs are avidly scouring the user marketplace, intensely studying every utility and enhancement they can. Lest this attention be

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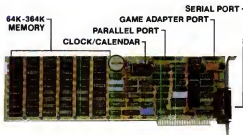
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misconstrued as flattering, think of it as goldfish being eyed by a cat.

Fact: IBM's first UNIX, PC/IX, is firmly rooted in UNIX System III technology, one generation behind the others. It is highly tailored to the PC, giving some performance benefits. On the other hand, it lacks many of the Berkeley features that have proven to be so popular. Some of its features will doubtless change as IBM migrates to multi-user UNIX-based microcomputers.

Fact: UNIX's largest presold audience is the waves of graduating classes of computer science majors from the world's (yes, the world's) universities. These people don't need to be convinced. Everybody else does.

Fiction: UNIX is a good network environment. Oh, it's great at remote execution, electronic mail, and networklike multi-user functions, but it is incapable of distributing files or simultaneous access to files across multiple machines. Multiprocessor, distributed-file systems are necessary to the growth of the computer industry. People are hard at work on the problem, but UNIX, as we know it, is not the answer.

Fact: IBM is pushing hard, from the executive suite on down, for user acceptance of UNIX. And this from a company that the IBM-watchers swore would never do anything that put an extra nickel into AT&T's pockets. Of course, nothing precludes the company from writing its own UNIX-like operating system, after it has hooked us on PC/IX.

Fact: Digital Research, Inc., has signed a deal with AT&T to develop and promote applications software for UNIX System V. Also, DRI will do the port of System V to Intel's 80286. Many are counting on this chip to be the cornerstone of IBM's multi-user micros, which will be offered later this year and in 1985. Also, since System V is also being ported to the latest chips in the 68000 line and National Semiconductor's excellent 16032 and 32032, nobody, not even AT&T, has all its eggs in one basket. Lest you think that

DRI is an also-ran where the IBM PC is concerned, take note: The company is doing business with seven IBM divisions and has been accused by DEC (which uses CP/M-86) of being an IBM shop.

Fiction: The fastest microcomputer implementations of UNIX are based on the 68000. This is roughly akin to saying that people have blue eyes. The speed of a given UNIX implementation is highly dependent on the hardware configuration of the system. Those with hardware-based memory management will consistently

Like the elephant
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outperform those that depend on the processor for executing memory management instructions. The improvement is analogous to the difference between performing floating-point operations on your PC with and without an 8087. I'll go out on a limb: An 8088 with proper memory management hardware can execute multi-user UNIX faster than a 68000 without such hardware.

Fiction: Few business applications are available for UNIX. Just what did you think AT&T was doing with all those PDP-11s? Whupping Crays at computer chess? There are literally hundreds of packages available for UNIX, covering all aspects of the business environment. There are sophisticated word processors, full-featured accounting systems, financial planning packages, and some of the best database management packages available anywhere. Virtually all of them are multi-user systems, courtesy of UNIX's talents in managing multiple file access. The influx of new packages is enormous, encouraged largely by Microsoft's wide distribution of XENIX on a variety of machines.

Some conclusions are in order to make this collection of facts and fictions more than a flight of fancy. First, UNIX's heritage has earned it a place of honor among today's operating systems. The strength and simplicity of its design are a strong foundation for future growth.

Second, it's not going to carry much favor outside of computer science circles unless some of the better shell programs become more widely available. How long did it take you to learn MS-DOS' command syntax? Do you use AUTO-EXEC.BAT and other batch files so you don't have to remember arcane command conventions? Figure that it'll take you twice as long until you can bumble around effectively on a UNIX system without a menu shell or other system simplifiers.

Third, despite IBM's blandishments, why in heaven's name would you spend \$900 on PC/IX to cut yourself off from all the programs you know and love that run under PC-DOS, which cost you nothing? Is the prospect of UNIX-style multitasking so seductive that you'll hang up *MultiMate* and *SuperCalc*? Just so you can run *uucp* in the background?

The answer, of course, is that MS-DOS is a dead end. Single-user systems will be with us for the foreseeable future, but they're not the answer to business and technical situations where users need to share data. Networked personal computers are an answer some of the time, but they can be a real problem when it comes to multiple simultaneous access to files, since each brand of network uses a different method to carry out this task. Also, the networks are founded on multi-user extensions to a single-user operating system. As there are no standards, the applications developers stay away in droves.

UNIX answers these concerns succinctly. New operating systems are being developed all the time, but none provides as clear a path to the future needs of professional computing as UNIX.

Today, you may not be ready for UNIX, and it may not be ready for you. Tomorrow, the script will change. ■

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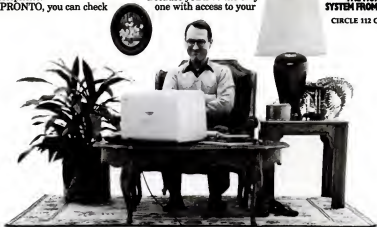
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The Hidden Costs of Software

When old-timers write their own programs, they avoid many of the hidden costs of commercial software. But they also risk remaining ignorant of the software solutions of others.

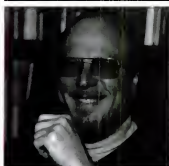
The assessment you make of the relative costs and benefits of the latest commercial software depends on the perspective you have on the programmer's art—long or short, personal or remote. My perspective is sufficiently deep to allow me to see the hidden costs of commercial software. My experience goes back to 1956 when I began programming for IBM on the IBM 650 and 704.

At that time, the rental cost of the machines was hundreds of times greater than my programmer's wage. The computer—and the 650 was to me a personal computer—was the costly element in the equation. For economic reasons, the 704 was strictly a time-sharing operation, and only the FORTRAN development team had unlimited access to it. They were permitted to expend vast machine resources to create a means of automatically generating code with the efficiency of a master programmer.

Though they never reached their goal, in a few years, nobody cared. The dramatic reversal of the relative costs of hardware and software is nowhere better illustrated than in my own case. Now I can buy a computer with much more memory than the 704 for less than what I charge for 1 hour of consulting.

I can also purchase someone else's programming time in the form of commercial software. When I recently needed a sys-

tem to make cash flow projections, I discovered a wide choice of many fine, off-the-shelf spreadsheet programs capable of doing the job. All listed for much less than the value of the time I would have to spend



Gerald M. Weinberg

writing my own program. Nevertheless, the economics of the situation did not favor a purchase. Why?

The answer is the hidden costs of software. I could write my own specialized spreadsheet program in two hours. If I didn't like it, I could modify or scrap it with no great effort or loss. But to choose a commercial product, I would have to survey a crowded field of candidates, narrow the choice, and gather detailed information on each one. This process easily represents a 3-day effort.

My hometown of Eagle, Nebraska, it seems, does not have a thriving computer market to make the search easier. Everything would have to be done by phone or mail. Moreover, after making my choice and waiting a week or longer for the order to be filled, I would be obliged to do the installation myself.

At this point, the real work would begin. I would have to learn to use the package, and I would have to convert all my present files to meet its syntactical requirements. Writing my own program might take 3 to 6 hours. The hidden costs of commercial software could be as many as 56 hours. For old-timers like me, the economic choice is obvious.

The danger of such a choice, however, is that it would leave me ignorant of what's new in the computer market. I could thus remain an old-timer until I became as outdated as the IBM 704. To avoid technological senility, I believe you should invest between 10 and 20 percent of your time and money investigating new things. If you take risks rather than play it safe, your old-timer's skills won't lock you out of tomorrow's progress. ■

Gerald M. Weinberg has more than 25 years' experience as a consultant and researcher in the field of computing. His most recent book is Rethinking Systems Analysis and Design.

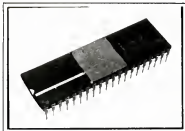
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Letters To PC

Response to RYFM

Luther Sperberg's review of John Bear's book, *Computer Wimp: 166 Things I Wish I Had Known Before I Bought My First Computer!*, was thorough, thoughtful, and amusing. ("Don't Be a Computer Wimp," *PC*, Volume 3 Number 6). I particularly enjoyed the excerpts.



Regarding the "RYFM" excerpt, I have no doubt that customers who ignore the instruction manuals that accompany their purchases can be a source of continual frustration to retail store personnel. However, the RYFM situation may be a symptom of a serious problem within the industry: the unbelievably poor instructions that often come with otherwise excellent products.

I have purchased products that were so poorly documented that I actually found the manuals amusing despite my frustration with them. When I turned to sales personnel for assistance, I quickly discovered RYFM applies to retailers as well as purchasers of computer products.

From the consumer's standpoint, permit me to offer an acronym that applies to

far too many instruction manuals: SLLOP, or Sheds Little Light On Product.

David Einhorn
Silver Spring, Maryland

Software Copying

I read Bill Machrone's "Pitfalls of Corporate Copying" with interest (*PC*, Volume 3 Number 5). "No, I won't copy the disk for you! Why not? Because it's illegal." Those words have been my contribution to the halting of software piracy, and I've had to say them a number of times over the past couple of years. As a matter of fact, they were among the last words I spoke while I was still employed at a multinational corporation that shall remain nameless.

I suspect that my ex-employer is representative of the prevailing corporate attitude toward software piracy. Here are some examples: If we must have it, we'll get a copy from our friends at the computer club. The vendors don't really care how many copies we make as long as we buy one. I'll bet we can find someone to break the copy protection with Lockzip. The vendors are not losing anything on our copy since we wouldn't have it if we had to buy it. Everybody is doing it; what will they do, lock the whole country up?

Who allows software to be copied? Very few individuals who have shelled out several dollars for a package are going to allow someone else to make a copy for nothing. So it follows that most first time copies have been made by employees of a business that has purchased the original. And once the chain starts, the original cost loses its inhibiting value.

The "free copies" will turn out to be more expensive to all of us in the long run. We'll pay for them in other ways, such as poor software quality, unavailability, inconvenience, and additional costs caused

by the developer's security efforts. I have been in the software business for the past 14 years, and I find software theft very disturbing to put it mildly. In the past, my company has employed the standard non-copyable disk approach even with its attendant backup problems. The Nondisclosure agreement route has also been tried. None of these have been fully satisfactory.

In all honesty, it appears that only one solution, and an expensive one at that, remains available for the vendor: Some

**No, I won't copy the
disk for you!
Why not?
Because it's illegal.**

method of hardware control, as Machrone suggests in his article. This is no answer to the people marketing software in the low end of the price scale.

In my opinion, it will be a long time before hardware manufacturers provide aid in this area. They will probably begin to consider this problem only when they become more involved with application packages.

My company has resorted to a hardware device that accompanies our software. It gives the user a permanent memory cache in addition to fulfilling the identity need of our security system (the memory is backed up). Users may exploit the permanent memory in any manner they choose and are free to make as many copies of the program disk as they are comfortable with. So far, this system has worked. To our knowledge, not a single unlicensed user of our ISAM file system for the PC exists.

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LETTERS TO PC

I guess you've probably heard all this and more by now, but I just couldn't resist the temptation to write and express my opinion. Keep up the momentum and something will happen.

W.R. Hill
Shawnee Mission, Kansas

Energy Management System

In response to R. Ted Krasnesky's letter in "Letters to PC" requesting an energy management system for his PC (*PC*, Volume 3 Number 5, page 84), Electro Design, Inc., markets *Digitrol*—a PC-compatible, digital I/O board. It will control motors, fans, lights, electric valves, audible alarms, heaters, air conditioners, sprinklers, pool systems, solar applications, and other devices. The address is 690 Rancheros Dr., San Marcos, CA 92069; (619) 471-0680.

Nick Woodall
Rochwall, Texas

Update on the TI

I am pleased that Winn Rosch was generally favorably impressed by the TI Professional Computer ("Sizing Up The Professional," *PC*, Volume 3 Number 4). I



know that the article was written several months ago, and for that reason there are a few statements that need clarification. I'd like to add a few updates on this product line.

The current Winchester drive is a 10-megabyte unit. The 5-megabyte version is no longer offered. Memory may now be expanded to 768K via an option kit announced in November 1983, to be available in the second quarter of 1984. Third

The TI Software Journal briefly describes almost 500 software products available for the TI Professional Computer Family.

party vendors also offer memory expansion. There is significantly more software available for the TI Professional Computer Family than Rosch's article indicated. MS-DOS 1.25, MS-DOS 2.1, UCSD p-System, CP/M-86, and Concurrent CP/M-86 operating systems are all available, as are versions of BASIC, COBOL, Pascal, and FORTRAN. The *TI Software Journal* briefly describes almost 500 software products available for the TI Professional Computer Family. New software is becoming available at the rate of one package per day.

Ted Jemigan
Texas Instruments Incorporated
Dallas, Texas

PC Tutor Wins

It was interesting to note the differences in the replies made by Mark Zachmann in his column "PC Tutor" (*PC*, Volume 3 Number 4, page 388) and by Karl Koessel in his similar column, "The Help Screen" (*PC World*, Volume 2 Number 3, page 39) to an identical letter sent to each by Charles W. Therrien. Personally, I liked Zachmann's reply, which was "off the top of my head without testing it."

Mead S. Moores
Wilmington, Delaware

PC Interference

About the time that the IBM PC first appeared, I saw a few articles about the problems of radio frequency emissions

from microcomputers affecting other electronic devices. Recently, I've begun to experience similar difficulties. Last Christmas I was given a cordless telephone. About the same time I also bought a \$39.95 imported wall phone for my study. As soon as I turned on my PC, I thought the whole world was trying to ring me up! Both phones chirp and chatter so much that I have to unhook them while working on my PC.

It would appear that the IBM PC is also an excellent transmitter! The keyboard and the printer seem to be the worst offenders. I'm familiar with industrial techniques for shielding electronic equipment and cables for these emissions, but they are all too expensive for a personal computer system. Surely this problem must be compounded in many business applications where numerous PCs operate around other electronic equipment. Shielded cables and RF gaskets come to mind, but where can I find these for the PC? Have you any ideas on reducing these emissions from the PC?

Maurice E. White
Papillion, Nebraska

You are not the only one having this problem. For more information on this subject, please see a related article in "PC News," PC, Volume 3 Number 9.—Ed.

The Makings of dBASE II

I would like to contribute a few facts in the interest of historicity concerning your *dBASE II* cover story (*PC*, Volume 3 Number 2).

I was working with Hal Pawluk at his ad agency when Hal Lashlee first walked into the office. He had no business card, but he had an interesting problem: he and a gentleman named George Tate had the makings of a great new nameless company that was about to market a great new nameless database program. Could we help? "Sure," we said, "we'll get back to you."

LETTERS TO PC

The first problem was what the company name should be. After getting mired down in all kinds of trendy tributes to software gloriousness, I suggested that we imply some feet on the ground. Use their own names—Ashley-Tate. Now remem-

through the periodical archives and come across this issue of *PC*. Don't sneer; minutiae such as this just might spell the difference between a C and a B-minus.

Michael P. Noonan
Los Angeles, California

Modern Languages

Thank you very much for the article, "APL: A Language for Modern Times" by Mark Rubenstein and Stephen D. Lewis (*PC*, Volume 3 Number 6). *PC Magazine* has done a first rate job with its Languages section. It is refreshing to see such professional overviews of "new generation" creations such as APL, C, Modula-2, and so forth.

Jim Fiegenschue
Carrollton, Texas

Thanks for the commendation. Perhaps you should have said "and so FORTH."—Ed.

Correct Number

I enjoyed reading Frank Vaughan's review of our *Decision-Analyst* software package ("The Decision Makers," *PC*, Volume 3 Number 5). However, the phone number of Executive Software, Inc., is not (705) 772-3373 as you stated in the article. The correct number is (705) 722-3373.

Kingstone (Bey) Reed, President
Executive Software, Inc.
Dover, Delaware

Women and Computers

Apropos of the Stephanie Stallings' "From the Editor's Screen" ("Computer Equality for Women," *PC*, Volume 3 Number 6), I want to tell you what happened to me last night.

We were expecting a call for my husband, so when my daughter answered the phone call for a "G. Kaufmann" she gave the message her father had instructed her to. It quickly became apparent that this was not the expected call. It was *PC Magazine* calling, so my daughter said, "Oh, you must want to speak to my mother" (I

am the computer person in the family). The caller responded "No, just tell your father I called."

Needless to say, I was livid, and I am still annoyed. Please get the message through to your callers that there are women out there who buy your magazine!

Gale Kaufmann
Washington, DC

Three cheers for Stephanie Stallings! My company is a pillar in the microcomputer technology and training community. The major contributing force comes from a MIS department that has in-depth technical support, excellent contacts, innovative ideas, and hard-working productive people. Oh, and a few more things—a woman interactive technology specialist, a woman manager of interactive technology centers, and a woman MIS director.

Sandra J. Guisto
Stamford, Connecticut

I Need a User's Group

My boss just purchased an IBM PC for our office. He also bought an insurance rating program that he thinks he can use without any lessons. I need a user's group. Can you help?

Sylvia Eland
Clawson, Michigan

The editor of "Club News" sympathizes with your dilemma and suggests you check the "Club News" list printed in each issue of PC. You should be able to find the name of a group near you.—Ed.

Queuing Files

I hope that *PC* might be able to help with a problem our office has been having. When using our PC for word processing, our secretary finds it very time consuming to babysit the PC and printer while *WordStar* prints a 50 to 100 page report. Other than leaving to work on a second PC while the first one is printing, are there ways of queuing *WordStar* files?

The Wizardry
Of
Ashton-Tate



I finally suggested that we stick with the same solid simplicity we started with. Simply call it D-BASE.

ber, Hal Lashlee had no business card, they had no letterhead, no names were ever written down, and euphony will play tricks with double l's every time. Your ears won't split 'em. We thought his name was Hal Ashley. However, after we were corrected, neither Lashlee-Tate nor Ashley-Tate seemed to quite make it. Ashton-Tate did.

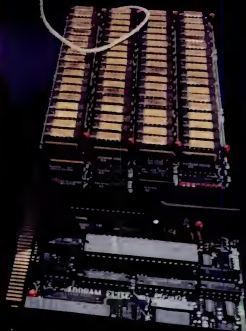
With that settled, we turned to naming the program. The process was wandering inexorably down the grim, boring road of relational's triumph over hierarchal, when I finally suggested that we stick with the same solid simplicity we started with. Simply call the product D-BASE. Graphics and caprice pushed the evolution to *dBASE II*.

Maybe, just maybe, about a dozen graduating classes from now a computer-science graduate student, right up against a deadline on a microcomputer history paper, might be desperately racing

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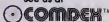
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LETTERS TO PC

The advertisements I have seen for print-spooling software, often included as part of multipurpose expansion boards, suggest this is possible for some software. I have been told that it will not run with WordStar. Is this true?

I have also read of disk emulation systems and wonder whether the memory could hold the WordStar program either for use by the printer while printing a report, or for use by the operator for other word processing at the same terminal. Can you help clarify these confusing situations for me?

David R. Clore
San Francisco, California

There are several ways to print long WordStar files. The simplest is to string several short files together with repeated 'KR (Read file) operations. However, this can create one h-u-g-e file, and long files don't work so well on floppy disks. If you have enough memory, you can create a RAMdisk and copy the large file to it.

The best way, however, is to use the queuing feature of MailMerge. It's easy, according to PC's WordStar expert, Steve Manes, who included this and other tips in a booklet he produced called UnderGround WordStar. Say you want to print out three files called FIRST.FIL, SECOND.FIL, and THIRD.FIL. Go into WordStar's N (nondocument) mode and create a master queuing file called QUE (or anything else you want to name it), as follows:

```
. n FIRST.FIL
. pa
. n SECOND.FIL
. pa
. n THIRD.FIL
```

Then, while in WordStar's no-file (aka not-editing) opening menu, hit M to start a MailMerge operation. (Be sure your MAILMERGE.CVR file is on your WordStar disk.) When the screen asks for the name of the file to MailMerge,

LETTERS TO PC

type in *QUE* (or whatever you've named your queuing file). It will print out *FIRST.FIL*, then *SECOND.FIL*, and then *THIRD.FIL* automatically.

Steve points out that there are two things to watch for. Note that there are carriage returns in the *QUE* file above, between the *fi* and the *pa*. You may omit these carriage returns if you are absolutely sure the individual files you want to queue up, each end with a carriage return. Also, if you want to make sure each file starts on a new page, be sure to include the *pa* commands.

One last thing—you may include a drive in front of the filenames, that is, *B:FIRST.FIL*. In any event, it works like a charm.

Incidentally, you can print one file at the same time you're editing another by using *KP*. Unfortunately, doing two things at once like this really slows both of them down. But if you're the kind of writer who often pauses while he writes or edits a file, this can save you much time.—Ed.



File Transfer

I enjoyed the article by Alex Holmes on transferring files from the Apple to the IBM PC ("From Apple To IBM And Back Again," *PC*, Volume 3 Number 3). I would like to add a few notes on the file transfer program from Personal Computer Products. *VisiCalc* formula files may be transferred, not only DIF files. The program can transfer any file—binary or ASCII. It can transfer files at up to 9600 baud, and can connect directly or use a modem. There are program conversion utilities included and the program operates

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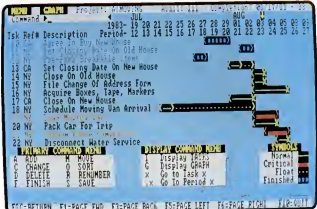
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Best Letter Winner

Here's David Gardner, the winner of our "Better Letters" contest, receiving his complimentary software package from Helen Taffet of Peachtree Software Inc. Gardner is enjoying his PeachText 5000. Our thanks to Gardner for his letter and to Peachtree for their cooperation. To read the winning letter, see "And The Winner Is..." (PC, Volume 3 Number 1, page 77). We hope this will be an inspiration for all of you to write to "Letters To PC." Although you won't get free software, you might get the satisfaction of seeing your letters in print.—Ed.

Correction:

The correct address of the Dvorak International Federation is: c/o Virginia Russell, 11 Pearl St., Brandon, VT 05733; (802) 247-6028. ("For Dvorak Fans Only," "Letters To PC," PC, Volume 3 Number 6, page 84.)

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Shells: A New Face For DOS?

A shell is a program that wraps around an operating system to change the way that operating system interacts with us. Norton wonders whether a strong demand for these programs exists.

One software topic we're hearing more and more about these days is "shells." A shell is a program that stands between the user and the operating system. Its purpose is to gracefully enhance the way the operating system interacts with us.

The basic concept behind a shell is simple: to make an operating system user friendly. Most operating systems don't interact all that effectively with their users, and DOS is no exception. If computers are to become the everybody-has-one consumer items that we'd like them to be, this situation must change. Shells are an attempt to make our operating systems easier to use.

The face that DOS presents to us is created by the command interpreter, COMMAND.COM. As the DOS manuals have stated from the beginning, COMMAND.COM is a replaceable part of the operating system; we could provide our own version of it, which might interact with us differently. Provided a new version of COMMAND.COM performs certain key internal functions of the original, it can change the external characteristics in any number of ways that work.

If you read between the lines of the DOS manuals, you may sense that IBM and Microsoft are pleading with us to write better command interpreters. The first DOS manual took great pains to out-

line in detail the task of a new command interpreter. The latest versions of DOS provide a convenient way for us to substitute our own command interpreter, which can be given any name we choose. (In the



Peter Norton

DOS manual you'll find a discussion about the CONFIG.SYS option covering the SHELL command in the section titled, "Configuring your System.")

Shells can function as direct replacements for the command interpreter, COMMAND.COM, but it's also possible to impose a shell on top of the standard command interpreter. All the shells I've seen so far have been imposed over COMMAND.COM; they have not replaced it.

When DOS 2.0 was in the works, we

heard rumors that it would come with new command shell that would enhance the way we interact with DOS. As we know, this didn't happen. I don't know why; though I understand that Microsoft was in favor of including a feature like this. Perhaps the time element prevented this from happening, or perhaps the idea was deliberately killed by IBM. After all, if the way that we interact with DOS was changed, IBM would have had to revise an enormous number of instruction guides.

Fortunately quite a few software authors have been rushing in to fill the gap for us. A number of shell-type programs have been appearing. To get a feel for what's available, I've been trying all those that I can get my hands on.

I found that the shell programs I tried fell into three distinct categories, which I call pop-ups, cockpits, and true menus. Let's take a look at each type, but first let me point out that when I characterize shells according to type, I am distinguishing their most prominent characteristic. Most shell programs provide a variety of features in addition to the one I use to classify them.

Many programs have a feature commonly called pop-up menus, or help screens. This feature provides reference information, command summaries, and other helpful facts. They are designed to appear and disappear at our choosing.

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Pop-up shell programs take this idea and apply it to any program under any circumstances.

Trillian's *VisuALL* shell falls under the pop-up category. At the touch of a key-stroke it provides command descriptions, guidance information, and a selection of commands that can be turned on or off by pressing the cursor keys or Return, respectively.

Of course, a pop-up type of shell must be adaptable, so that it can provide information that relates to the programs we are using. Who needs a *WordStar* menu when you're using *Xywrite*? I would expect any pop-up shell to provide this kind of flexibility, and *VisuALL* certainly does. It comes with several ready-made pop-ups that are stored in data files, and you can create your own pop-up files, too.

I found plenty of features in *VisuALL* that I didn't particularly care for, and each version I tried had some annoying bugs. Nonetheless, I give *VisuALL* a rave review for visual presentation. Trillian's visual treatment is first rate.

The next class of shell programs is what I call cockpits. These saturate you with information. The screen of your computer is densely packed with data about the files and commands available; they give the date, the time, and the phase of the moon, too. This information overload reminds me of an aircraft cockpit—hence the nickname. Obviously cockpit shells are for people who want to know more, not less. If you're frustrated by the inability to see at a glance what's on your hard disks, then this type of program is for you. I've worked with two of them. One, IBM's *FileCommand* was reviewed by Steve Manes (see "The FileCommand Mystery," *PC*, Volume 3 Number 3). "If you think DOS is too simple, then you'll love FileCommand," Manes states, and I agree with him wholeheartedly. He has described the very nature of cockpit shells. I won't say anything more about *FileCommand* because Manes reviewed it thoroughly. The other cockpit that I've tried is Bourbaki's *IDIR*. This program is first

rate, and I recommend it over *FileCommand*. Both use the same approach, but *IDIR* is of better quality. Cockpit shell programs work by showing you information that can be automatically extracted from your disks: lists of command files, directories, and so forth. This means that they don't require customization and don't

If Symphony sells as well as 1-2-3 it could become the de facto windowing system.

need special support files to match the application you're working with. Unlike the other types of shell programs, cockpits require no further effort on our part.

I call the final category menu shells. They are designed primarily to provide us with a structure of command menus, which guide and automate our use of the program we are working with. A menu shell works like the structure of functional menus that we find inside some application programs.

The best example of menu shell programs I've seen so far is IBM's *Fixed Disk Organizer (FDO)*. The name is misleading; it implies that the program is specific to the XT's fixed hard disk, and this is not so. Nonetheless, this and all the other shells that I've seen are much more valuable when used with hard disks than with floppies. *FDO* provides a structured organization to the commands that we give to our computers. It comes with a ready-made command structure as well as the tools necessary to easily create our own. As an example, *FDO*'s top level menu presents six choices: word processing, spreadsheets, communications, business, development tools, and DOS commands. Each choice leads to submenus, which get down to specific operations. While the ready-made example is largely made up of IBM programs, the menus you can create

lead to the actual tools you use.

FDO has an unassuming appearance: its menu screen presentations are dull. But the flexible command menu structure that it provides is extremely useful. Individual PC users may find it worthwhile to set up *FDO* menus for their own use. And for organizations where many novices use PCs, *FDO* could be extremely valuable. This program could become a major trauma-saver for offices.

In many ways *VisuALL* and *FDO* represent opposite sides of the coin. *VisuALL*'s screen presentation is impressive, but its value is only marginal; *FDO*'s appearance is dull, but the program is useful. *VisuALL* is difficult to customize, whereas customizing *FDO* menus is a snap.

I've given you a quick run through on shell programs that are currently available for the PC. These are my initial, overall impressions, so don't take any specific remarks too seriously.

Both shell and window programs have been the topic of a great deal of discussion in the microcomputer industry. Both of these appear to be examples of technology that is trying to drive the marketplace: The gee-whiz computer types create something wonderful and expect the micro world to buy it in mass quantities. Although this happens often enough, success is never guaranteed. I'm beginning to suspect that both shells and windows are products without a strong demand.

Consider Mitch Kapor's company, Lotus, and its runaway hit *1-2-3*—that's marketplace demand. The new expanded version of *1-2-3*, called *Symphony*, provides a repertoire of five main functions, and the ability to accommodate other software products by integrating them into the *Symphony* fold. If *Symphony* sells as well as *1-2-3*, it could become the de facto windowing system, even though it wasn't intended to be a window product at all. Intuition tells me that *Symphony* could become the working environment for PCs. If this is the case, this program may kill both windows and shells. ■



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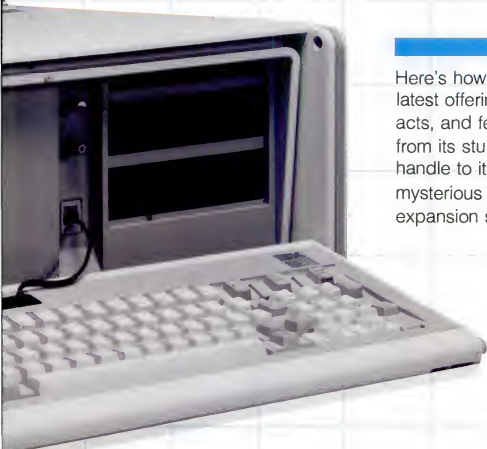
Photograph: Dennis Chalkin

Inside The

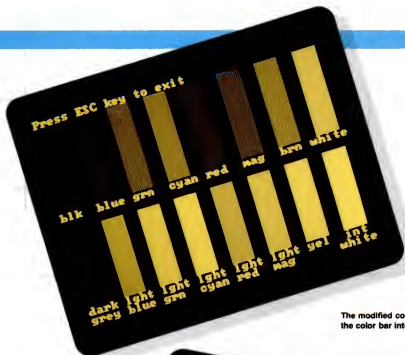


The IBM Portable PC packs a dependable personal computer into a convenient, solid, and, above all, luggable case.

PC Portable

A photograph of an IBM PC Portable computer. The device is a light-colored, rectangular unit with a hinged lid that is open, revealing a dark screen and internal components. A keyboard is attached to the front of the unit. A power cord is plugged into the back. The background is a light-colored grid pattern.

Here's how IBM's latest offering looks, acts, and feels, from its sturdy handle to its mysterious eighth expansion slot.



The modified color graphics card turns the color bar into an even amber scale.



The portable is available only with the color graphics card. The text display isn't perfect, but it's usable.



You can't approach a machine like the new PC Portable without some preconceptions. The IBM logo on the cardboard box sets the tone, which is reinforced by the elegant design of the case.

From the rugged handle to the sturdy locks and pivots, the suggestion is solidity, dependability. You retract the two spring-loaded catches that secure the keyboard to the front of the case and, for a change, the keyboard *doesn't* clatter to the table. Instead, it swivels down gracefully and can either be used in place or detached via the modified tilt adjusters at the rear of the keyboard. Other portable manufacturers take note: Nothing else out there holds a candle to the IBM's keyboard attachment design.

It's truly one of those little things that means a lot.

Once you've got

the keyboard folded down, you are struck by the dark orange background of the screen, a glowing portent of amber characters to come.

Just to the right of the screen is a small control panel with brightness and contrast adjustments, and the jack for the keyboard coil cord. The cord itself is telephone-style, unlike the python-sized monstrosities favored by some portable manufacturers. At the far right are two half-high disk drives, arranged horizontally instead of in the more customary (for portables) vertical position. Above the drives is a slot that will hold four or five floppy disks, just right for a weekend of computing at home. It isn't as large as the capacious cavern on a Columbia portable, but it'll do.

A Case Study

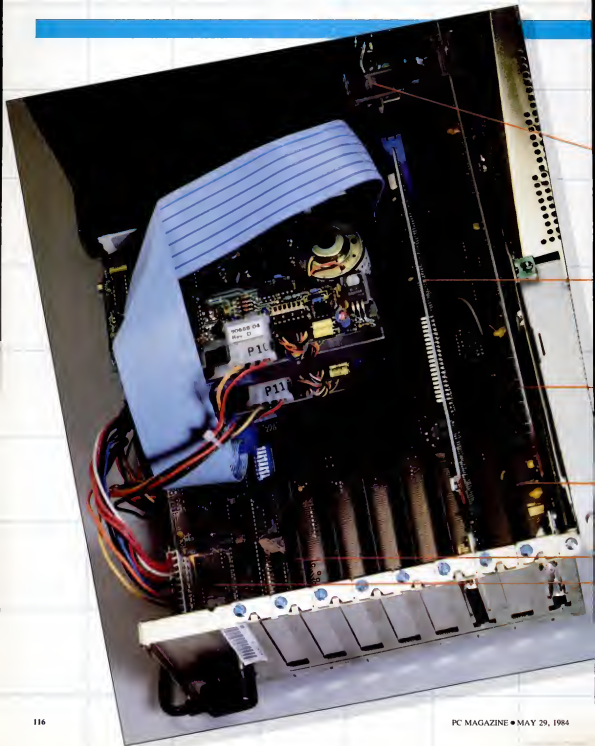
Before we delve into the innards, let's take a leisurely tour around the outside of the machine. Another little thing that counts is the rounded corners at the front

edges of the case. As simple as it may sound, they make it easy to tilt the machine from its upright carrying position to the horizontal working position. A pair of bumps on the bottom of the case tilt the machine up slightly, aiding your view of the screen. On a normal desktop, the screen points more toward your chest than to your eye level, but it's eminently usable. Portable manufacturers should add a bit of built-in tilt to the CRT.

At the rear, just below the sturdy carrying handle, is a folding panel. Hinged in the middle, it provides access to the power cord jack, power switch, and expansion slots. Like the rest of the case, it is made of beige injection-molded plastic. Unlike the rest of the case, it doesn't feel very substantial. Time will tell if it is up to the rigors of portable computing.

The entire rear of the case serves as a shell to surround the inner workings and is fastened to the front panel by six heavily-chromed, socket-headed screws visible from the







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front. These handsome fasteners are of the type usually secured by circlips or captive washers so they don't fall out and get lost. With that expectation in mind, I loosened them and stood the machine on end to remove the cover shell. Naturally, all six screws clattered to the Formica table top and onto the floor. So much for expectations.

My first view of the inside of the machine was a bit of a surprise, for the innards were completely covered by perforated metal panels. Unlike a Compaq, which has a certain mechanistic beauty to it, the PC Portable is an agglomeration of unlovely stampings. Plated steel covers the monitor, perhaps to minimize the effect on the CRT of magnetic fields from the disk drive motors. Aluminum covers the top of the circuit board as well as the entire bottom of the machine.

Blue Screws

The look of the insides is distinctly un-IBMlike. The subassemblies appear to have been specified at different times by engineering teams who were mad at one another. The various assemblies use many sizes and styles of fasteners, from hex-headed sheet metal screws to Torx-head fasteners. Ostensibly, the Torx and star heads are to keep you out of places where there are no "user-serviceable components." At any rate, it's a complete departure from the PC design ethic.

The real puzzle is that the screws that hold the expansion slot cover plates onto the rear panel are no longer the familiar 3/16-inch size. Nor are they the familiar 1/4-inch size. Instead, they are that handy size found on every Swiss Army knife, 7/32-inch. Why did they change? Maybe a manufacturer whose shelves are jammed with 7/32-inch nut drivers got to somebody at IBM. Fortunately, these screws are easily discerned from their more pedestrian cousins by their distinctive blue color. Isn't progress wonderful?

Not that there isn't some good engineering here. The chassis has two nylon rollers to help you ease it out of the case

shell. Other nylon bumpers prevent the color graphics adapter from touching the metal of the video display subassembly. Power cables traverse the bottom of the machine in a clever aluminum tunnel, safe

The inside of the Portable PC is an agglomeration of unlovely stampings.

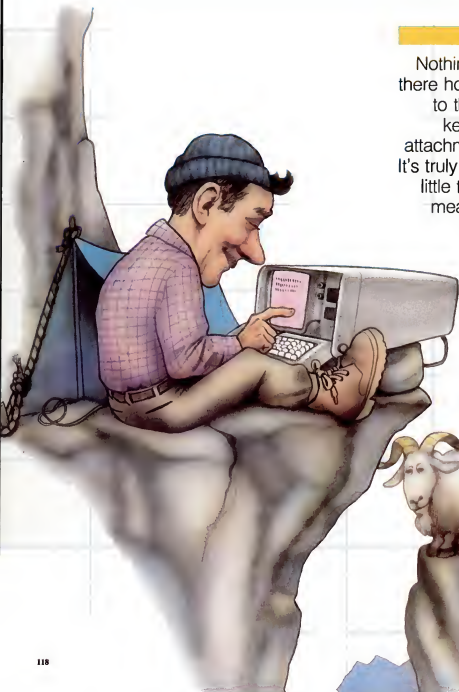
from abrasion and abuse while the case is off and impervious to radio-frequency emanations from the motherboard. Any stray RF that may have coupled onto these lines won't get past their aluminum prison. Further, the inside of the front panel is coated with conductive paint, again to block the escape of RF. The front-mounted brightness and contrast controls are backed by a small metal subpanel rather than depending on the plastic front panel for strength.

The video display is a subassembly made by Zenith Radio Corp., the same folks who bring you those nice color TVs. Their slogan—"The quality goes in before the name goes on"—is definitely true in this case. Zenith provides some of the best monitor assemblies to be found in terminals or computers. The image on the screen is sharp and readable—as readable, that is, as the color graphics character set can be.

Forever Amber

The Portable PC is available only with the color graphics card. The display monitor uses the composite output of the card in order to produce a monochrome image instead of the color image. To this end, the card has been modified to produce a better gray scale (or amber scale in this case). The balancing resistors that blend the red,

Nothing else out there holds a candle to the IBM's keyboard attachment design. It's truly one of those little things that means a lot.



blue, and green color signals into the composite signals are optimized for the portable machine. Blue, which used to disappear on a monochrome representation of the color screen, is now rendered as a fuzzy, reduced-brightness image. You still don't get an underline mode. Overall, it's not perfect for text, but it's usable.

When you hook the Portable to a standard RGB monitor, the display is indistinguishable from what you get with a normal PC. Because of the rebalanced gray scale, though, performance on a color composite monitor is a little different. While our Sony Trinitron displayed an acceptable COLORBAR.BAS, the colors were dis-

tinctly whiter, giving pastels instead of fully saturated colors.

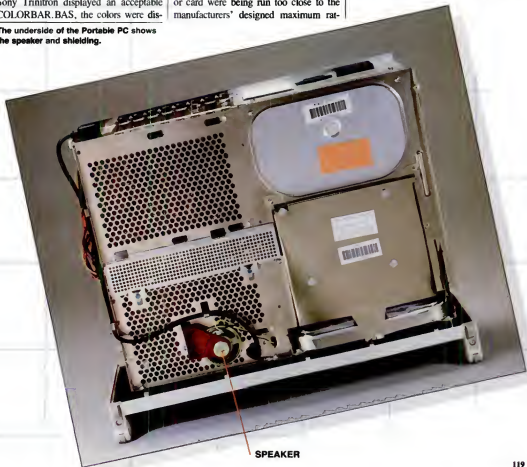
But the real reason for having the color card in this machine isn't the color, but the graphics. You can put up with the color board's lower-resolution characters when you're word processing. But the IBM mono card would have eliminated the ability to do graphics. Like the old line, "If I have one life to live, let me live it as a blonde," so the Portable PC might say, "If I have one program to run, let it be Lotus' 1-2-3."

Some of the components on the old color card were being run too close to the manufacturers' designed maximum rat-

ings. The minor changes on the new card will increase the reliability of these components. While there was no apparent problem with field failures on the old color card, we applaud any change that makes the product better or more reliable.

The monitor subassembly runs on standard composite video, which is derived from the Berg connector (vertical pins sticking straight out of the board) on the color adapter. This connector, nominally used for driving an RF modulator, leaves the RCA connector on the rear panel free for connection to a composite monitor but

The underside of the Portable PC shows the speaker and shielding.



SPEAKER

Like the old line, "If I have one life to live, let me live it as a blonde," so the Portable PC might say, "If I have one program to run, let it be Lotus' 1-2-3."



causes a space problem inside the machine.

Slot Spots

The only full-length expansion slot is between the color card and the disk controller. The composite video plug stands too high off the card's component side and interferes with the next slot. And don't go thinking that you can squeeze something in there. You can't. A simple change to a right-angle connector on the composite video wire would save the day, but I doubt that many purchasers of the machine will have much taste for chopping off the old connector and soldering in a new one. Let's hope that IBM perceives this as a problem and makes the necessary change soon.

Another problem with using the full-length slot is the placement of the subpanel that holds the video controls. Cards with components at the back edge that are higher than the typical integrated circuit will probably hit the panel. I found several modem boards and even a memory board that would not clear. Since the card-retaining guide is molded into the Portable PC's front panel, there is no devious way around this one.

As for the remaining slots, numbers 4, 5, and 6 will accept a standard 5-1/4-inch mini-board, similar to the two short slots on a PC-XT. Because the Qume drives are about half an inch longer than most other half-high disk drives, you can't use a 5-1/4-inch board in slot 7; it interferes with the power connections to the drives. If IBM had used drives such as the Tandon, Shugart, or TEAC, there would be no problem.

Yes, the Portable PC has an eighth slot, one more than the XT, and no, it doesn't bring out all the bus lines. I couldn't find a soul within IBM who would even venture a guess as to why it's there, but you certainly can't do much with it in its current incarnation. All of the power lines, interrupt lines, data request and acknowledge lines are present, along with most of the handshake and clock lines. *None* of the

There's a Surprise Inside

So you thought skyhooks were a thing of the past. Think again.

IBM's hot new Portable PC comes with a nifty unadvertised surprise hidden inside—a real, honest-to-goodness skyhook. We're not talking about some arching Kareem Abdul Jabbar field goal that brings the L.A. Forum crowd to its feet. Or a fearsome army helicopter that can latch onto a Greyhound bus and spiral it into the clouds.

We mean one of those old-fashioned novelties that Grandpa used to whittle out of a hickory knot, or that you bought for half a buck at the gift counter of the science museum when you were seven. They're really pretty astonishing little devices—skyhooks draw throngs of disbelieving spectators wherever they're shown.

IBM prefers to think of its Portable PC Skyhook as a retainer for long adapter boards. The one you get free with your luggage PC snuggles between the CRT RF cage and the disk drives. Its sole purpose, according to IBM, is to wedge the expansion cards into rigidity. But techies know better than that.

The IBM Skyhook is an injection-molded sliver of clear plastic about 2-1/2 inches long, and shaped vaguely like the letter "L" or a chaise lounge, depending on which way you hold it and on how mentally unstable you are. It can also look a little like the ends of corner moldings carpenters litter the floor with when finishing the ceiling. Or maybe a snug boot for a foot-bound geisha. Or maybe Italy.

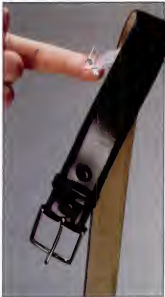
But what it's really good for is transfixing observers in their tracks. Here's how it works:

You're making that big sales call, trying to impress that important client. So you snap off the cover of your Portable PC, wrench out the PC Skyhook (being

careful not to shear any capacitors off the color board in the process), and whip the belt off your trousers. (In cities like New York or San Francisco, this last step can convey other messages, so choose your situations with care.)

Then, hold the device so that the tip of

The Portable PC Skyhook is shaped like the letter "L" or a chaise lounge, depending on which way you hold it.



the boot is pointing down and slide the edge of your belt into the groove where the achilles tendon would be. Got all that? You have to make sure you're using a fat belt so it fills the groove. Depending on the weight of your buckle, you probably will want to position the belt in thirds, so that the two-thirds without the buckle hangs down from one side of the PC Skyhook, and the third with the buckle droops from the other side. As in all phases of life, balance is critical.

To see the awesome wonders of the PC Skyhook, rest the other end of the plastic (the one that resembles a crucifix) on your finger. The end with the belt dangling off of it will soar into space unsupported, magically cantilevered. It looks as if the whole works will clatter to the ground, but it doesn't. It may sway and bob a little, but that adds to the effect. If you practice, you can suspend it on the eraser of a pencil, or even on the pencil point. When every eye is on your mysterious, gravity-defying object, close the sale.

This works by playing tricks with the center of gravity, or something like that. You can't see the center of gravity, or taste it, or smell it, so scientists may be having a real laugh on us when they hand us this explanation. But it does work, and it continues to mystify everyone except the really world-wise. (One caution, however: Be sure your pants don't fall down.)

You know, it's hard to find a good skyhook nowadays. But now, thanks to IBM, every home can have one. And you get a nice carrying case for it that doubles as a computer. This really separates IBM from the so-called "PC-alikes." And at three grand, it's a steal. —Paul Somerson

data bit lines or address lines are available. So you can power the board and it can issue interrupts, but there is no way to service them due to the missing address and data lines.

IBM is evidently not strongly committed at this point to the eighth slot. Dealers who have received their "spares kits" for the Portable PC report that no system board is included and that they are to use a standard XT motherboard if replacement is required. Indeed, the Portable's system ROM identifies itself as an XT (FE hex attribute byte). I was sorely tempted to stuff a half-high hard disk and a controller into the machine and see if it would boot, but the Portable I was testing was IBM's, not mine. The board interference problem also dissuaded me. It looks like all the necessary code is in the ROM, though, so a hard disk version of this machine will be a bolt-in operation.

The power supply, at 130 watts, can certainly handle a hard disk. It also has a switch that permits 120- or 220-volt operation, a boon to international travelers. Also, the power supply is happy with either 50 Hz or 60 Hz power. Look out, Europe.

The availability of power in the machine is evidenced by the utter stability of the display as the disks are accessed, a claim that not all portables can make. The power switch follows IBM tradition by being integral with the power supply, obviating the need to run line voltages through the computer to a front-mounted switch. The positioning of the power supply locates the power on switch on the rear panel at the left corner of the machine.

Driven to Distraction

After a few days of use, our test machine became erratic in its ability to boot up. I got "disk boot failure" messages most of the time. Using *Readscope*, an excellent disk drive analysis program by ReadiWare Systems, Inc. (Box 680, West Redding, CT 06896), I found that drive A was rotating at 275 rpm instead of the 295 to 305 considered acceptable. I

adjusted the drive, and all was fine. An hour later, it wouldn't read properly again; this time the speed was over 350 rpm. I readjusted it, but its ability to hold a speed deteriorated rapidly and finally disappeared.

I have to say that I'm disappointed that IBM selected Qume drives for use in the Portable PC and PCjr. My experience with 5¼-inch Qumes has not been good, although they make the best 8-inch drives anywhere. A pair of Qume half-highs that I had installed in my XT had difficulty holding speed adjustments over a 3-month period, and one of them shed a read-write head. Maybe bad drives come in threes, but I would be more comfortable with one of the other brands in there.

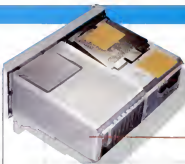
Portable Without Parallel

It is tremendously good news to a lot of people that they can finally buy a portable from IBM. Although no one has given up their Compaq, Eagle, or Columbia dealerships, the purchasing decisions will be easier in many a True Blue corporation. If they can get machines, that is. As of this writing (late March), the machines are just trickling into the dealerships.

The Portable PC still lacks several features that are more or less standard on its competitors. It is shipped, for instance, with no I/O—not even a parallel port. The competitors feature a parallel port and one or even two serial ports. With the short expansion slots, you can bet that companies like Tecmar will be doing a land-office business with 5¼-inch boards such as the Wave. With its parallel port, serial port, and battery-backed-up clock, what Portable PC could be considered complete without one?

In the same vein, the purveyors of short memory cards will have a field day until IBM wakes up. Half a meg really breathes life into a machine: You can buffer disk I/O, use RAM disks and still have room left over for big 1-2-3 models.

If there is a single best feature of the Portable PC, it is doubtless the keyboard. If you've read my previous lambastings of



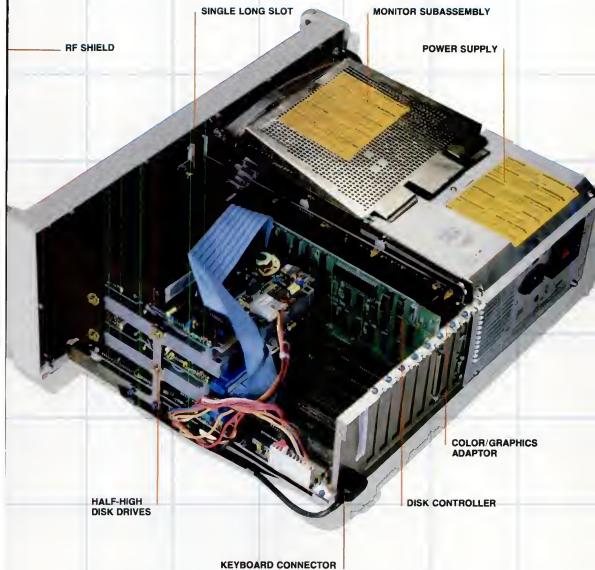
I couldn't find a soul within IBM who would even venture a guess as to why the eighth expansion slot is there.

the IBM keyboard layout, I'll give you a moment to recover. Here's the pitch: You use a PC at work and maybe a Compaq on the road or at home. You swear a blue streak every time you have to readjust to the minor differences in keyboard layout and feel. They both stink, but you can get used to anything, right? Anything, that is, but thrashing back and forth from one to the other.

Now, at last, you can gear up for one lousy keyboard and go clacking away merrily, with nary a backward glance. Sorry, IBM. Sorry, Key Tronic. But you had it coming.

Overall, though, this is a good machine. The marketplace will fill those short slots. Either IBM will fix the access problem to the long slot or someone else will fix it for them. The amber screen is handsome. The case is great. I hope for all concerned that the drives do not turn out to be a problem. We didn't spend a whole lot of time testing it to see if it was PC-compatible. After all, it is a PC.

Go ahead, try one out. Take Big Blue home for the weekend. It may never leave. ■



RF SHIELD

SINGLE LONG SLOT

MONITOR SUBASSEMBLY

POWER SUPPLY

HALF-HIGH
DISK DRIVES

COLOR/GRAPHICS
ADAPTOR

DISK CONTROLLER

KEYBOARD CONNECTOR

IBM

When IBM packed a portable PC into a flight bag size box, it went after the Compaq market and ignored the demand for laptops. But an IBM laptop may be just a marketing decision away.



Joins The Suitcase Set

IBM is the archetypical Hollywood cowboy gunslinger. One by one, competing computer companies pull into town to challenge it. "I'm faster than Big Blue," they boast, nervously adjusting their hardware on Main Street. IBM slowly turns to face the threat. An amused crowd forms along the sidelines. The upstart invariably gets off the first shot. It always just grazes Big Blue's muscular shoulders. Then, deadeye IBM draws a bead on the hapless newcomer and cuts him in half.

Why did IBM release a portable so prosaic and derivative that industry-watchers are calling it a "Compaq-alike?" Several reasons. It was becoming increasingly irked by this buzzing Houston-based gnat (only IBM can think of \$100-million-a-year Compaq as a pesky culicid). It saw these bothersome pests proliferating. And, all it had to do was reach into its storeroom of experimental machines and drag this portable out. In fact, it was a premature delivery. Word of the machine's existence had oozed onto Wall Street, and IBM felt

compelled to admit its existence before too many compatible manufacturers went belly up.

IBM is no slouch when it comes to research and development. There is undoubtedly a closet somewhere in Boca Raton or Armonk stuffed with a dozen or two prototypes just waiting for the nod from the marketing department. The Portable PC was an easy construction job. Just take one XT mother board, mix with two of IBM's uncharacteristically mediocre Qume half-height drives, make the expansion slots too small so it doesn't eat into the PC's market, and add one amber monitor and a 120/220-volt power supply for a bit of spice, and voilà. The whole thing was probably designed on someone's coffee break.

Puny Screens

Why didn't they shake up the industry by releasing a true lap portable? IBM has a reputation for letting other companies do the pioneering and then jumping in and creaming the market once the public is clamoring for a new item. But there is no



When packed and ready to travel, the Portable PC measures only 20 x 17 x 8 inches.



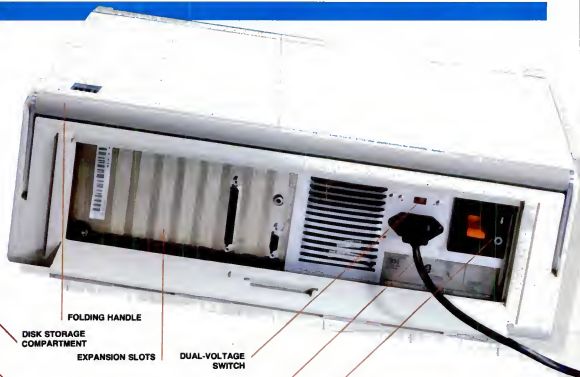
question that an IBM-compatible lap portable would be a hit. Radio Shack sold nearly 100,000 briefcase portables with a slow, pathetic screen, little memory, and non-IBM-compatible software that could best be described as modest. The market for a real PC crammed into a TRS-80 Model 100 box is enormous. Or is it?

Market researcher Future Computing has examined the portable computer industry's entrails and predicts unparalleled growth. By its reckoning, nearly a quarter of a million battery-powered computers will fly off the shelves by the end of the year. This figure will double in 1985, and catapult to 1.5 million units in 1988.

The main problem confronting portable



Ready to go: Large spring-padded plungers attach the keyboard.



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COMPARTMENT

EXPANSION SLOTS

DUAL-VOLTAGE
SWITCH

HALF-HEIGHT DISK DRIVE

AC CORD

POWER SWITCH

SCREEN CONTROLS



Spring tension holds rear door closed for travel.

computer manufacturers is that most users want top-quality displays and disk drives, which are expensive, bulky, and power-hungry. Most notebook-sized portables on the market have puny screens, which make using them a chore, and Rube Goldberg disk arrangements (or none at all). At best, they are one step up from pocket calendars and memo books.

However, the situation is changing. Loose-lipped Compaq staffers have leaked the specs on an upcoming PC lap model that reportedly contains a megabyte of RAM and a plasma screen, and tips the scales at a scant 4 pounds. Kaypro will be marketing a notebook-sized PC-compatible manufactured by Japanese fishmonger giant Mitsui. Kyocera Corporation, manufacturer of the TRS Model 100 and the lookalike NEC 8201, is rumored to be readying a lap PC of its own. And some industry observers predict that Tandy will stuff a Model 2000 into a Model 100-sized box to join the fray. These won't be cheap, however. The Kaypro/Mitsui entry, for

instance, will probably start at around \$3,600.

There is an optimum size for a personal computer. Too large and you have to leave it on a desk. You can't throw it in a suitcase, or use it on a plane or train, or take it home from the office to toil away into the night. Too small and you can't read the screen or store data or use the keyboard efficiently.

The Grid Compass, which has been out for nearly 2 years, is close to the perfect package. It has a decent, full-travel keyboard, a gorgeous non-LCD flip-up screen, an 8086 chip (and an 8087 math coprocessor to boot), a speedy internal modem, and a bubble memory. It also costs between \$6,000 (for a version with 384K of bubble memory and no internal modem) and \$8,000 (for one with half a

briefcase portables with 16-line LCD screens by the end of the year, but few, if any, with 25-line LCD screens. LCD screens have many problems. You need a fairly bright light to read anything on the screen at all. And you have to hold the screen at an angle to see it properly. The bigger the screen, the more the angle becomes a problem. And LCD screens can't easily display graphic images.

Grid's computers use electroluminescent screens, which give off their own light instead of reflecting the light in the room. The startling difference between the clarity and precision of Grid's electroluminescent screen and anyone else's murky LCD screen is one big reason small computers haven't yet displaced desktops or luggables. In a word, LCDs are awful. However, they're cheap, and you don't

they're simply too much trouble to move. To use a desktop somewhere other than its home base you have to unsnake the rat's nest of cables in back and pack it as if you were moving nitroglycerine, especially if your machine has a hard disk.

Some experts feel the real reason there aren't more portables is simply that we're in the infancy of the micro explosion. Eri Golembo, vice-president of the New Jersey-based Prodigy Systems chain of computer stores, believes that desktops are an idea whose time has gone. They perch on our desks only because they aren't available yet in compact versions with substantial computing power and readable screens.

Golembo points out that most computer owners he knows let their hardware hog most of their desk surface. The petite Macintosh footprint is an obvious baby step in the right direction. If prospective purchasers could choose between a normal-sized PC and one a quarter of its size but otherwise identical in every respect, no one in his right mind would buy the oversized version.

The situation, says Golembo, is akin to the early days of television or stereo equipment. Back then, you bought the biggest, showiest piece of furniture you could wrap around the radio tubes. But as the electronics improved and the cabinets became sleeker and trimmer, tastes changed. Consumers began buying the tiniest components they could find. Now half the TV sets sold have handles on top, even though most purchasers never budge their sets an inch. And thousands of Walkman owners are buying little amplifiers and speakers to hook their portable stereos up semi-permanently.

Most computers are far from portable, and users adapt their work habits to this constraint. Golembo feels that users will learn to take advantage of portability as hardware becomes smaller and easier to heft. It's hard enough to take a transportable home for the weekend; with a PC or an XT it's a major headache. But when all you have to do is slip something the size of

LCD screens have many problems. In a word they're awful. However, they're also cheap and use very little power.

meg of bubble and a 300/1200 baud modem inside), and doesn't work unless you plug it into the wall or a meagre 1-hour battery pack.

Grid vice-president Alan Lefkof told PC that while he expected IBM to release its portable when it did and in the announced configuration, he was surprised that it was so heavy. One of the most-often-heard complaints about the Compaq-alikes is that they're too hard to transport. Lefkof thought IBM would find a way to make it lighter and smaller. He did admit, however, that IBM had done a very nice job of allowing international users to switch to a 220-volt power source.

Lefkof thinks we'll see quite a few

need much power to run them.

Anchors Aweigh

But wait just a second. While it's true that some users need to carry their computers with them on business trips, or schlep them along on their daily commutes, or move them from one office to another, most do not. The majority of users have one desk, which they plopp their PC permanently on top of (next to their phone and their Rolodex and their manuals and their files), and use the whole area as a workstation.

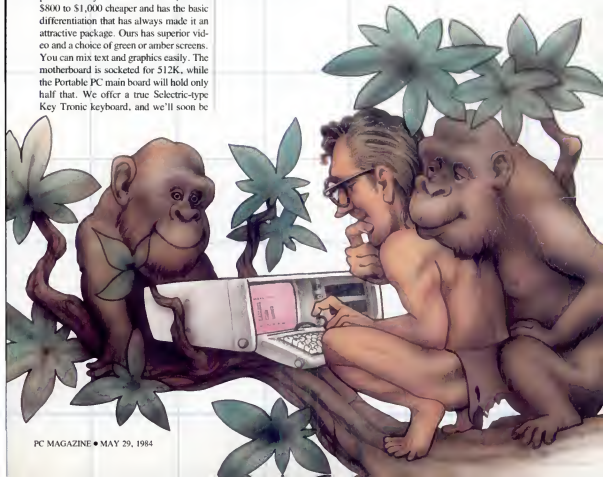
The real question is whether computers are generally anchored to desks because there is no real need to move them, or whether they're planted there because

a fat notebook into your briefcase, increasing numbers of users will take them wherever they go.

Smaller Boxes

Some industry leaders aren't intimidated by IBM's move into the market; some even embrace it. Corona Data Systems president Daniel Carter feels that "IBM's move into portability will bless the market and expand the volume of sales for everyone." Carter's theory is that while IBM has now legitimized portables, buyers will soon see that the Boca Raton entry is not the best value: "If you compare it side by side to the Corona, ours is \$800 to \$1,000 cheaper and has the basic differentiation that has always made it an attractive package. Ours has superior video and a choice of green or amber screens. You can mix text and graphics easily. The motherboard is socketed for 512K, while the Portable PC main board will hold only half that. We offer a true Selectric-type Key Tronic keyboard, and we'll soon be

Some industry leaders
are not intimidated by
IBM's move into the market.
Some even embrace it.



second-sourcing another. Ours comes bundled with top-quality software; IBM's is totally unbundled. Parallel and serial ports are standard on the Corona; the Portable PC doesn't come with either. And the box is smaller than IBM's."

Carter isn't at all worried. "We were surprised that the IBM portable was such a ho-hum product. We expected something a little more modern and flashy. And since we use a totally different distribution channel from IBM, we won't be competing with their portable directly." Carter doesn't seem to be overly concerned about

the expected profusion of lap computers either. "They're going to be fine as notetakers. But it will be hard to give them all the features of a real portable. One of the most limiting problems will be lack of expandability. How will anyone be able to put in add-on cards, for instance?"

Carter also notes that companies such as Corona currently have all the facilities in place to produce portables in large numbers. IBM's initial outlay to its dealers is said to be one or two per store per month at the outset, with conditions not expected to improve for half a year or so.

Compaq's Ken Price is not much worried either. "The features of the PC Portable don't compare with the features of even the original Compaq, which has been on the market for over a year and a half. And we couldn't believe it had no hard-disk support." This is surprising indeed, considering that Compaq expects half its 1984 sales to be for the hard-disk-sporting Compaq Plus.

What most retail chains want to do is lessen their dependency on IBM. The stores don't want to become just IBM shops.

Compaq wasn't caught napping. Price explains that "like everyone else, we expected IBM to release a portable, and we planned accordingly. And like everyone else, we thought it would be more of a product than it turned out to be." In fact, Price sounds downright delighted. "From the reports in the press, dealers won't have any easy time getting Portable PCs. And dealers always like to have a second alternative. We're the primary alternative to IBM. We're confident of our network of 1,100 dealers in the U.S., and 50 or so in Canada, and can supply them with all the machines they need."

Non-Blue World

The IBM introduction was also music to the ears of Gavilan's CEO Manny Fernandez: "I think it's a significant entry to the portable world. It's another indication of the important role portability will play in the future of computing. Sure it's a conservative machine; IBM has never produced anything truly innovative. But you can't discount the Portable PC; it gives IBM breadth. The most important thing about the machine is the IBM name on its case." One reason Fernandez seems so upbeat about the Portable PC is that it does not compete with his truly lap-sized Gavilans. The other reason is that he reports he's sitting on top of over \$100 million in backlogged orders, which the company is starting to fulfill in earnest.





Pumping portables: With portable computers, getting more for your money is not always an advantage: Hyperion, 22 pounds; IBM, 30 pounds; Columbia, 33 pounds; Eagle, 32.5 pounds; Compaq, 33 pounds.

Ron Petersen, vice-president for product planning at Eagle Computer, Inc., adds his voice to the chorus: "IBM's new addition didn't break any new ground and could best be described as bland." He does feel that while the Portable PC is priced aggressively, "it will not have much impact on Eagle. We have carried a broad-based product line so a company like IBM can't come in with one machine and eliminate us from the market."

Petersen mentions an even more important issue. "Where is the mentality of computer retailers today? Their major concern is that IBM represents too much out of every dollar they take in, perhaps 80-plus cents out of that dollar. What most retail chains desperately want to do is lessen their dependency on IBM. The IBM product line keeps growing, and computer stores don't want to become just IBM shops. What makes stores especially angry is that IBM has been announcing really interesting new products—like the 3270 or the XT/370—that it has been

keeping for its own National Marketing Division. Maybe they'll let retailers sell it, but only after their own salespeople have a crack at it. Because they want to lessen that dependency, most large computer retailers are actively courting Eagle and other large microcomputer manufacturers. The world will never be totally blue.

"Eagle will continue to listen to the needs of the users and the retailers and respond appropriately," Petersen adds. "The trends are in clearly different directions. One is obviously for laptop computers. These will be dedicated machines, very much like Convergent Technologies' Workslate or the TRS Model 100, but with more features. They'll have limited keyboards, mass storage, and displays, since the price has to be kept low. What drives this particular market is software. There are no standards as yet for laptops. It's really surprising that no Microsoft or Digital has come along with a laptop software standard. We'll definitely see a market for these machines that is verticalized. It will be very much like the market Hewlett Packard carved out for its line of programmable calculators."

Petersen feels the real growth area may be elsewhere. There is a big market wait-

ing for the emergence of true full-function portables—15 pounds or less—and a number of derivative products. These will probably have some sort of flat panel display, and a full function keyboard. Most importantly, they'll run the software that's out there today. "IBM is looking in this area; while IBM is not a pioneer, such a machine is a logical evolution of their product line.

"The important thing to remember," Petersen emphasizes, "is that we're currently in the definition phase, the shake-out phase. The market is maturing. Market needs are changing. The market is starting to catch up with the technology. Consumers right now are very tentative and concerned, and they equate the IBM initials with security. They know IBM isn't going to go under. However, in a year or 18 months the name Eagle and some of the other IBM competitors will mean the same thing as IBM. We'll be the survivors. People won't be worried whether the surviving non-IBM companies are going to be around to support their machines.

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Microsoft 256k System Board.....	429
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CIRCLE 139 ON READER SERVICE CARD

"IBM did establish a standard and spurred a whole industry," Petersen admits. But he predicts that "IBM will yank people around one too many times in the future with its just-average machines.

If Eagle has released the IBM Portable we would have been crucified. Before too long, the market will become more a consumer market where the concern is not for technological innovation, but for user-friendly performance. And there's plenty of performance in the 16-bit world; the 32-bit machines can address more memo-

The Portable PC may not be the perfect computer, but the amber monitor and the power supply are high-quality all the way.

ry, but they're not necessary to run the kinds of applications people want. At Eagle, we're especially concerned with the little things that, when added together, make users happy. As the market matures and the initial shakeout ends, people will buy computers for such features, not for the security of the IBM name."

Out of the Closet

The Portable PC may not be the perfect computer, especially because most of the currently available third-party add-on boards won't fit inside. Its display may not be as sharp as some, but the amber monitor and the power supply are high-quality all the way. The styling isn't bad. The keyboard is the best on the market. So what if the shift is one key over—you get used to it. The action and the feel are unbeatable.

And by all accounts, there may be a hard-disk version and a svelte lap portable with three familiar initials on them before too long. All IBM has to do is take a short walk into the R&D closet.

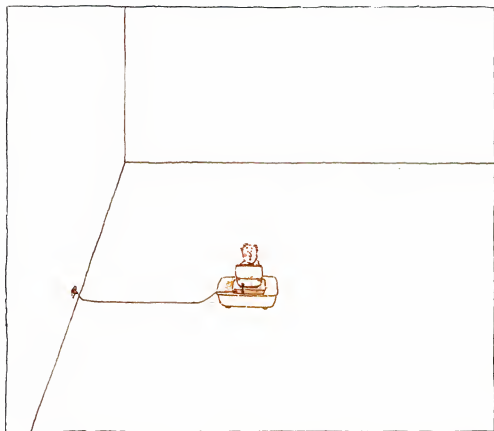
If you don't like the prospect of lugging 30 pounds but want a portable that is guaranteed to run most IBM software, consider purchasing a PCjr. The PCjr is very small and light, and it will fit conveniently into most suitcases with room to spare. You can even buy an optional IBM traveling case for it.

Since the PCjr is designed to work with any color television set, you don't have to carry around a bulky monitor and its weighty power supply. A small adapter plugs the PCjr directly to the antenna leads. And because the keyboard can use an infrared umbilical, you can operate it from across the room. As an added fillip, you can buy an internal modem (although the one IBM currently sells runs at a lethargic 300 baud).

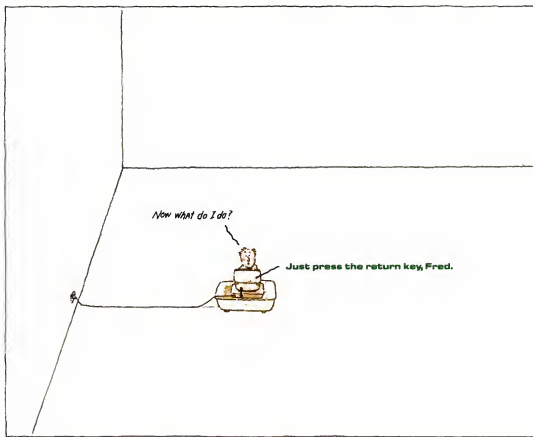
If you're a salesman who is on the road most of the time and has to communicate daily with the home office, using a PCjr may be a smart move. You pull into your hotel room, snap the connector onto your television set, plug the modem into the modular jack, and you're in business. You can even kick off your shoes, hop onto your bed, prop a pillow behind your head, and type away from across the room; the 40-word PCjr default screen is eminently viewable on most hotel color TVs.

In fact, if you added DMA access and a separate video buffer to the PCjr, you would get a full one-drive PC in a box less than half the normal size. It is just speculation, but IBM could turn the PCjr boards into a fairly small, powerful lap computer. It even has an external power supply, which means you could plug it into a battery pack or perhaps a cigarette lighter in a car. The only thing lacking at this point is a screen. But even there, IBM has been experimenting with plasma displays of all sizes. Who knows? There could be a true lap portable from IBM sooner than you think.

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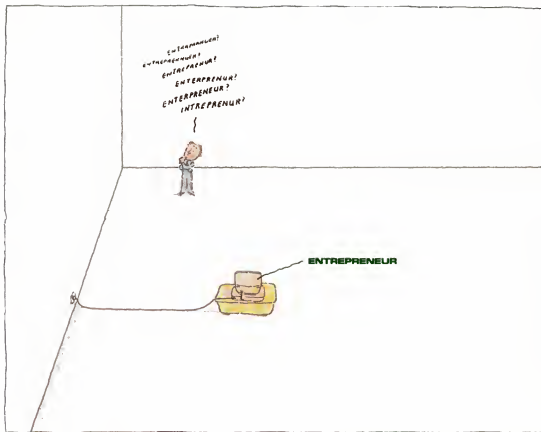
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All the President's PCs

The White House is on the cutting edge of political technology with EOPNET, a network of XTs that keep the presidential aides' information-gathering process state-of-the-art.

From the outside, it is still a splendid example of Palladian-style architecture, circa 1799, and a symbolic repository of America's quill pen and parchment paper past. Inside the white mansion at 1600 Pennsylvania Avenue, however, the twentieth century has arrived. The White House has been strung with PCs from wing to wing by a team of young, enthusiastic systems engineers who have brought the executive office complex up to the state-of-the-art in automation.

"I'm very proud of what we've done here," says John F.W. Rogers, assistant

to the President for management and administration and the prime mover behind the computerization of the White House. He is especially pleased because, he says, "we really started from scratch."

Rogers himself started from scratch in the White House—he worked in the mail room when he was 18. But he rose quickly through the Republican managerial ranks, and when he returned as part of President Reagan's team in 1980 he was 24, with correspondingly young ideas about how an office complex should be run. "The White House was shamefully inefficient in

PRESIDENT'S PCs





Craig Fuller, assistant to the President for cabinet affairs, and his PC-XT.

the area of automation," he recalls. There were 34 word processors of various kinds scattered throughout the building, but most of the White House executives' voluminous correspondence was knocked out on hundreds of electric typewriters. Rogers found it especially galling that as the White House bookkeeper he was expected to write numbers into a fat general ledger book, the contents of which would later be transcribed into a word processor.

Rogers decided to automate, and the first step was getting rid of those clacking typewriters. In July 1982, the first of 168 IBM Displaywriters rolled into the White House. "We decided that, at least for the time being, the Displaywriters would have to be standalones," says Rogers. "There were just too many offices whose functions were not related to the functions of their neighbors." With standalones, the software could be tailored quickly to individual needs. "It would have taken 2 years to put together a centralized system," according to Rogers, who was not about to put the secretaries' stations on hold for that long just to hand a perfected

mainframe-based system to a new president in 1984. "One reason we chose the Displaywriter," he adds, "was that we knew IBM would eventually offer a communications set-up to let us convert from standalones to shared logic."

Rogers then made his most important move—he hired 29-year-old Tom Lewis, a respected business systems designer, and put him in charge of the newly created White House Automated Systems Division. Lewis coordinated the training of the 200 staffers who would use the Displaywriters and assembled a four-person "SWAT Team" that continually updated the users on new tricks their machines could do. "The clerical people loved the machines," says Lewis. "We met with no resistance at all."

The Birth of EOPNET

While Lewis was installing the Displaywriters, Rogers was thinking about a hands-on system for the upper echelon, including himself. He felt that an organization that guided the fate of a fast-moving world could no longer depend upon scribbled memos and bulletin boards. Rogers says, "We had to do something for the senior executives" who report directly to

John F.W. Rogers (left) and Tom Lewis.

PRESIDENT'S PCs

the President. He told Lewis he wanted a system that would allow the executives to send and receive electronic mail; access and search the wire services (Associated Press and United Press International) and other outside databases; access the mainframe that processes the federal budget; do "rudimentary local processing" including word processing, financial spreadsheeting, and graphics; and do all of the above with no prior computer experience and after only 30 minutes of training.

"And he wanted us to have it ready in 60 days," recalls Lewis. That kind of assignment gives lesser systems engineers the creeping loop-locks, but reflecting on it, Lewis merely smiles and says, "It was a pretty tall order."

He promptly assembled a think tank of five engineers, and within a week they came up with an outline for the Executive Office of the President's Information Management and Control Network, or EOPNET. Then they set to work.

"By far the toughest thing was writing the communications software," says Lewis. "The software had to be intelligent enough not only to dial all of the telephone numbers but also to turn on the modems automatically, emulate any kind of terminal necessary, and hook up with all kinds of outside services." He would have gladly bought a ready-made package, but nothing he found had enough power or flexibility.

For the stations themselves, the engineers chose IBM PC-XTs, to which they added 128K RAM and 256K ROM. They tacked on a graphics board, an IRMA board to allow communications with the mainframe, and a Gandalf packet switch to automatically connect the station to a central group of Ven-Tel modems.

One-Button Shopping

Lewis and his team finished the job in exactly 60 days. The prototype was installed in Rogers' office in November 1983. Since then two more XT's have been put on-line: one for Craig Fuller, assistant to the President for cabinet affairs, and

An organization that guided the fate of a fast-moving world could no longer depend upon scribbled memos and bulletin boards.

another for Richard Darman, deputy chief of staff. Eventually some 40 top-level presidential aides will have them. The configurations will vary slightly for each individual, but all will share a remarkable user-friendliness.

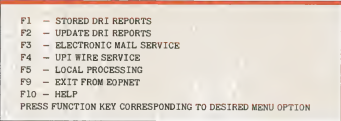
"Many of these executives have little or no hands-on experience, and they don't have the time to learn all about computers. We knew that if they were required to enter letters and words they would be intimidated, so we decided from the start to make the system entirely function key-driven," says Rogers, turning to his own station. "It's really one-button shopping." He switches the XT on and the opening menu comes up automatically (see Figure 1).

Pressing any function key brings up a new menu of function key choices; the system is about as difficult to operate as an automatic banking machine. If the user should punch something other than a function key, a graphic drawing of the keyboard pops up on the screen with a flash-

ing arrow that points out the function keys. The only part of the system that the function keys cannot drive is the local processing or word processing option. "But we have tutorial screens to take you through it," says Rogers.

One of EOPNET's strengths is its ability to let users effortlessly connect to databases and download the data into a package of local software that includes *1-2-3* and *WordStar*. For example, if you punch the DRI UPDATE key, F2, you are presented with a menu asking if you want to view quarterly or annual reports. After you choose, more menus appear, and you narrow your choice further. When you make your final selection, the report is automatically loaded into *1-2-3*. Now the function keys serve to move the cursor to any figure on the screen. You can type in a new figure—say, one that reflects a jump in interest rates—and the impact of that change will instantly ripple out across the spreadsheet. Pressing another function key will print the sheet. Similarly, you can download news stories into *WordStar*, add comments, and route the document to other executives' electronic mailboxes.

EOPNET can be used for everything from predicting international economic trends to writing poetry, but it is perhaps most universally used as a news tracker. Craig Fuller keeps tabs on what Cabinet officers are saying in public by having the computer drop wire service stories in which their names appear into his electronic mailbox; Rogers does the same for stories about the federal budget. The elec-



```
F1 - STORED DRI REPORTS
F2 - UPDATE DRI REPORTS
F3 - ELECTRONIC MAIL SERVICE
F4 - UPI WIRE SERVICE
F5 - LOCAL PROCESSING
F9 - EXIT FROM EOPNET
F10 - HELP
PRESS FUNCTION KEY CORRESPONDING TO DESIRED MENU OPTION
```

Figure 1: EOPNET's main menu. DRI stands for Data Resources Incorporated, an independent econometric database.



(L. to r.) Patrick Shannon, manager of information systems, White House; Patricia Bonney, project manager for office automation; Joseph McKay III, senior analyst/programmer; and Deborah Hazer, training and support.

tronic mail system also supports a program called *Talk Point* that keeps the President's men up to date on the White House position on dozens of topics. Thus the bane of all world leaders—having an aide spout a contrary opinion through ignorance of the latest policy shift—is neatly avoided.

For the moment, the electronic mail system uses ITT DialCom, an outside commercial service, but Rogers is hoping for funding to switch all the internal executive workstation communications over to the ever-expanding collection of Executive Office mainframes. Housed in the New Executive Office Building across the street from the White House, the new EOP

Computing Center has just acquired two new IBM 3083 mainframes. These are teamed with an IBM 4341, a massive 44-megabyte mainframe that does nothing less than number-crunch the entire federal budget. Rogers has already taken a tiny piece of the 4341's memory for his book-keeping and has been assured that EOP-NET communications can also be squeezed in.

"It's our plan to have a software package by June that will link the secretaries' Displaywriters to each other and to the executives' PCs, and then link both of those to the mainframes. We'll have our own internal network," he says. Increased security is one reason for the move.

Setting an Example

Rogers feels that the White House, in spite of the pomp and circumstance associated with it, is essentially "the nation's leading front office." He and Lewis are convinced that EOPNET will serve as a model demonstrating how to meet the fundamental challenge of business communications today: getting information to flow efficiently between the chief executive and the troops as well as into and out of the compound without forcing computer-illiterate senior executives to go to keypunch night school.

"I believe that the rest of the business world could benefit from this," Lewis says. "We were told by one of the major

PRESIDENT'S PCs



computer vendors that it takes the average user 2 to 3 weeks to become even moderately proficient in the use of a personal computer. That's not good enough. We are setting the stage for some changes that will affect the computer industry."

Office systems experts who have seen EOPNET agree. Thomas Billadeau, president of Office Systems Consulting Group of Cambridge, Massachusetts, says, "It's nice to see someone do it right for once." He says too many front offices "buy their software from whoever buys the business manager the best lunch. But the EOPNET team actually looked at who was going to use the system." He characterizes it as a "Ph.D." system—"Push here, Dummy. But I know that senior executives simply won't use it otherwise."

One rave review especially pleased the 36 employees of the Automated Systems Division, though the source was clearly biased. In a videotaped address, President



The XT in the White House Chief Usher's office.

Reagan recently told the Federal Office Automation Conference that the automation in the Executive Office could serve as a "fine example" to "encourage those throughout the federal government to improve productivity."

Front Office Tips

Before you set up a computer network at your company, take a lesson from the White House.

Rogers and Lewis concede that an exact copy of EOPNET would not suit every business. For example, most front offices do not have a burning desire to know what the wire services are saying 24 hours a day. But their experience has taught them four important lessons about office automation.

- Do not get hung up on centralization. Every day without automation means lost productivity, so install standalones while waiting for the proper mainframe and software. Outside commercial services can provide some communications capabilities almost immediately.
- The more senior the user, the more friendly the operation must be. Thomas Billadeau, president of Office Systems Consulting Group, echoes this based on his experience with Fortune 100 compa-

nies. "They buy \$60 million worth of automation and discover that the senior executives are allergic to it," he says.

- The systems engineer should regard himself as a benevolent dictator, not a doting parent. "We surveyed prospective users and listened to their suggestions, but in the end we had to decide," says Lewis. "If you try to please everyone, you end up with something that just doesn't work."
- When installing a hands-on computer system for managers, give the first units to the top brass and let later units trickle down to the middle and junior levels. Though it is the precise opposite of general practice, this helps erase the clerical stigma of workstations; indeed, managerial computers can become sought after as signs of having made it. —B.L.

The Presidential Micro

Now that EOPNET is up and running, Lewis and his think tank are building a similar network system for budget director David Stockman. New mainframe software will squash the federal budget into a single "cube" of information, and Stockman and his assistants will have PCs in their offices to call up "slices" of this cube. A horizontal slice might be a spreadsheet of past and future expenditures by one federal agency; a vertical slice would contrast current expenditures by different agencies. Like EOPNET, the budget system will automatically download these slices to local software so that Stockman can change a few figures and see the ripple effect.

Rogers and Lewis have streamlined not just the Reagan administration; they have also transformed the very nature of White House operations from this point on. But that's not enough. They are still waiting for the go-ahead to install the capstone in the EOPNET pyramid—a PC in the Oval Office. So far, President Reagan has not asked for his own PC. "The President is in the fortunate position of being able to ask an assistant for any information he needs," says Lewis.

But Rogers is patient. "We think he ought to have one of these machines," he says. "I hope he'll decide he wants a specially tailored station for himself." ■

Live Free With UNIX

Operating systems once assumed that hardware time was expensive while programmer time was cheap. UNIX made the opposite assumption and freed programmers' creative energy.



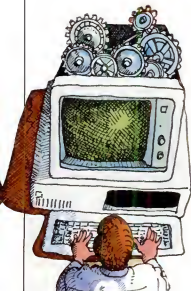
UNIX is a magic word. It's an operating system and suite of software that began life as one programmer's off-hours hobby. It grew explosively as the cult object of a band of zealots and is now rapidly on its way to becoming the world's standard operating system.

What's all the fuss about? What does UNIX mean to the average PC user or programmer? How does it tie in to the structural changes now taking place in the computer industry?

For users and software buyers, the most

important thing about UNIX is that it gives a big advantage to your software dollars. UNIX is designed to be easily understood, used, and modified by software designers. For end users, shorter development time means cheaper, more timely, and more portable software applications.

It's difficult to overstate the practical importance of this point. Hardware gets cheaper every month, while designer time becomes slowly but steadily more expensive. These two trends have created the historical pressure for more powerful languages and operating systems, and they



are the reason that UNIX has graduated from a laboratory toy to a tool that makes good economic sense.

A Short History of UNIX

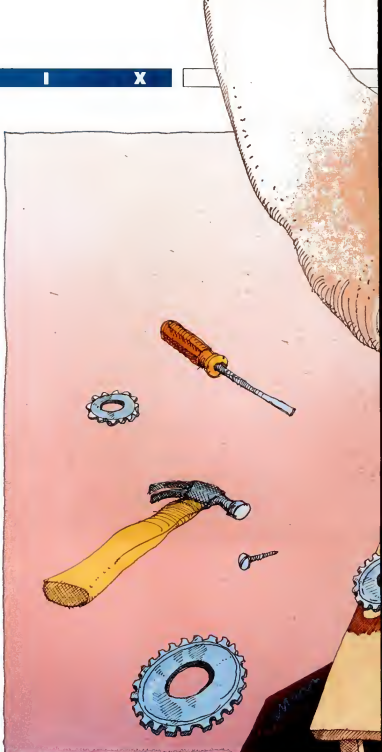
The best starting point for understanding UNIX's peculiar strengths and weaknesses and the attitudes of its fans is a look at its history. UNIX's evolutionary trail zigzags between industry and academe, individual brilliance and collective evolution. The contrasts in its development are rich and instructive.

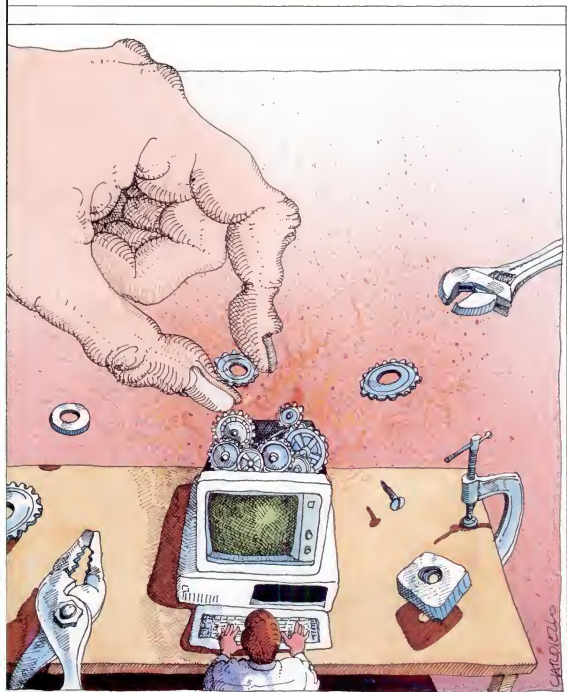
The first version of UNIX was begun in 1969 by Ken Thompson, a researcher at AT&T's Bell Labs, on a discarded Digital Equipment Corporation PDP-7 minicomputer. Thompson had developed a space-travel simulation (such as those seen on video games today) while working on MULTICS, an experimental operating system jointly developed by Bell Labs, M.I.T., and General Electric.

MULTICS was ahead of its time. Traditional operating systems had been designed around the assumption that hardware time is expensive and programmer time relatively cheap. MULTICS made the opposite assumption, providing a large set of features and facilities to ease the developer's task at the expense of machine efficiency. Unfortunately, on 1960s hardware the result was an elegant white elephant—clumsy, slow, and overdesigned. Bell pulled out of the project; M.I.T. and G.E. continued the development. Later, Honeywell bought G.E.'s computer division and the MULTICS system, which still runs on some of its machines.

Meanwhile, Thompson scavenged the PDP-7 for his orphaned game. While reimplementing it during his spare time, he started to play with some MULTICS-like ideas about file organization and operating system structure—and UNIX was born.

Like MULTICS, UNIX was built from the ground up as a programmer's workbench. Unlike MULTICS, it was built for small systems (Thompson's PDP-7 was considerably less powerful than the aver-





age PC today), so it had to be small and sparing of machine resources.

This combination of traits proved a winner. Other Bell Labs developers became intrigued by Thompson's software workbench. One, Dennis Ritchie, became Thompson's partner in enhancing UNIX to support an early word processing system on a DEC PDP-11/20 minicomputer. The system had its debut in 1971 and was an immediate success.

Thompson and Ritchie got funding for a PDP-11/45 and UNIX began to grow in earnest. Other departments at the Labs bought PDP-11s, threw away DEC's proprietary operating systems, software, and support packages, and ran their production on UNIX. Meanwhile, Thompson and Ritchie were preparing another surprise.

The original UNIX, like previous operating systems, had been written in machine language. It was accepted wisdom that, above all else, an operating system designer had to squeeze the last iota of speed and code compaction out of the design. Thompson believed that a state-of-the-art compiler could generate tight enough code to justify a new approach; he wanted to develop UNIX in a high-level language.

Thompson had experimented with BCPL, a simplified ALGOL-like compiled language. He wrote an interpreter for a subset called B and used it for some of UNIX's early compilers and utilities. Ritchie took the good features of B and added data structures to produce an interpreter called NB. In 1972, the C language was born, written as a compiler in NB.

C was designed to act as a sort of structured assembler, with both the clarity and expressiveness of a high-level language and the closeness to the machine that systems programming requires. In C, a programmer can use the hardware efficiently without being tied to one particular architecture.

In 1973, UNIX was completely rewritten in C. It became the first major operating system to be written in a high-level language and, as a direct result, the first

truly portable operating system. For the first time, an entire software environment (including tools, file system, multitasking, and device drivers) could be ported to a new machine by moving program text and recompiling it. This was done for the first time during the summer of 1977; UNIX was ported to the Interdata 8/32, chosen because it was as different as possible from the PDP-11 series. Shortly thereafter it was moved to an IBM 370.

It took AT&T a relatively long time to realize that it had the basis of a winning commercial product on its hands. Until the end of the 1970s, UNIX was distributed as a set of rather scratchy manuals and a magnetic tape—period. The system was called "Version 6" after the edition number on the documentation, and in many ways it was a mess. With no formal support program, no consulting service, and no maintenance, users were on their own—and the package cost \$42,000! Nevertheless, the UNIX user community working on the popular PDP-11 minicomputers grew rapidly both inside and out-

In early 1978 Version 7 was released. Around this time, a UNIX Support Group was formed at Bell Labs to take over maintenance of the system from the research division. The new version cleared up most of Version 6's adolescent blemishes and added significant new features, including a rewritten and greatly enhanced C compiler. The older system quickly became history.

Version 7 is still the "standard" baseline UNIX against which ports and new dialects are measured. The C language is essentially defined by the Version 7 C compiler; the army of UNIX-like operating systems that have sprung up since the release of Version 7 all claim (with varying degrees of truth) to be source code-compatible with it.

During the next 4 years, Version 7 was moved onto many different machines. The University of California at Berkeley ported it to VAX minicomputers and added many enhancements. This combination of VAX and Berkeley's UNIX became immensely popular at universities, soft-

Years ago one of UNIX's early developers began giving away green and white license plates emblazoned with the phrase "UNIX: Live Free or Die."

side Bell Labs. By mid-1978 there were already over 600 UNIX sites across the country.

Many universities and software houses had heard about the system through the research community's grapevine. As they caught on to its potential, the cadre of devoted UNIX enthusiasts began to grow. They struggled with bugs and woefully inadequate documentation, wrote applications, and added features.

ware development houses, science laboratories, and government installations throughout the Western world.

When Bell Labs finally made UNIX a commercial product in 1982 with its System III, it found Berkeley's 4.1 work-alike to be a strong competitor. From 1981 to 1983 there was also a rising tide of UNIX ports (such as Microsoft's XENIX) and work-alikes (such as the Mark Williams Company's COHERENT) for personal

computers, and many of these included Berkeley features.

During the late summer of 1983, Bell negotiated agreements with Intel, Motorola, Zilog, and National Semiconductor to support compatible UNIX ports for all their sufficiently powerful processors. People in the industry mainstream began to say "UNIX" and "world standard" in the same breath.

Digital Research, Inc., makers of the 8-bit standard CP/M, all but abandoned its campaign for 16-bit versions of CP/M. Before the year ended, it had announced a forthcoming line of UNIX applications and contracted to do Intel's System V port. As 1984 opened, Bell's response to Berkeley was only a few months old. Its System V had incorporated many 4.1 enhancements. Berkeley, in turn, had just released a controversial Version 4.2. No major mainframe vendor had yet endorsed UNIX, but it seemed clear that the post-divestiture AT&T that owns Bell Labs (now officially named AT&T Bell Laboratories) would soon move aggressively into the hardware market.

(Incidentally, please note that the name "UNIX" is an AT&T Bell Laboratories trademark and should be applied only to systems that are licensed by AT&T. I've borrowed the term "CLONIX" to describe a system built to work like UNIX but not descended from the original implementation by Thompson, Ritchie, et al.).

We'll get back to UNIX's present and predict its future later. Now let's examine the traits that made even the earliest and ugliest UNIX systems such a startling success.

The UNIX Philosophy

Years ago, one of UNIX's early developers began giving away green and white license plates emblazoned with the phrase "UNIX: Live Free or Die." UNIX fans loved them and they've been in demand since. These license plates reflected both the wry, self-spoofing humor of the UNIX tradition and a serious belief in UNIX as a liberator of the creative energy that was

A Devil's Operating System

To maximize aggravation for both users and programmers, follow these principles to design a perfectly annoying operating system.

UNIX is not exactly perfect, but even the quickest comparison with other operating systems (especially microcomputer and older mainframe varieties) will greatly increase your appreciation of it.

Here, therefore, is a selection of howlers from major operating system designs still current over large areas of the microcomputer, mini, and mainframe markets.

Making life complicated for users:

- Make file names short, so users have to deal with cryptic, compressed names. Force users to know about disk drive names in order to specify files. Make the files on a disk look like a single big list so the user won't have any real way of defining groups of files and will usually see the names of all the files on a disk when he or she takes a directory to find one or two of them. If you do have levels of directories, make sure there are only one or two. Make certain that there are enough restrictions to keep things difficult.

- Assume that your users will be forever as ignorant as they were on day 1 of using the system; hold their hands with an iron grip. Make all your utilities elaborately menu-driven or conversational with no way for experienced users or programmers to turn off the time-consuming chatter.

- Tie almost everything to the screen so the user won't be able to print interactive output or capture it to a file without going through an extremely convoluted exercise.

- Be single-tasking. Users really want to sit staring at the screen doing nothing while their one application crunches away. This will also force users to buy tricky extra software and even hardware to do things like print spooling that a multitasking operating system would do while hardly noticing the effort. If you do include support for multiple tasks, allow no more than some small fixed number of them and require special privileges to start one up. For extra fun, make it impossible for the user to do I/O to a task, or to kill it once started.

Making life complicated for programmers:

- Devise a different special format for the data files used or created by each group of system programs, and don't document any of them. Make sure that as few of the formats as possible are readable by humans from a printout, and, for more kicks, lace them with nonprintable characters that will confuse terminals and printers.

- Force all I/O requests to be performed in large fixed-length chunks with an elaborate set of options and protocols. Require programs to know what kind of file or device they are talking to (screen, disk, tape, or printer) and make the form of the requests different for each kind of device. Make random-access I/O a tricky special mode. For extra fun, require that programmers predeclare file sizes or pad the lengths of files out to a multiple of some magic but otherwise arbitrary number.—E.S.R.

wasted by more conventional, restrictive operating systems.

UNIX is a philosophy as much as it is a collection of software, and it represents a point of view that is radically different from that of most previous operating systems. As with any worthwhile philosophy, no 25-words-or-less summation can do it justice, but ponder these precepts:

- A program is an information tool. Good tools do one thing well and are handy enough to be used without frequent rereading of a thick manual. Program tools should be conceptually simple enough so their function can be grasped easily. A tool that tries to do all things for all people will usually end up doing none of them well. A well-designed programming environment should provide a rich base of examples of such tools and should encourage the building of new ones.

- Tools must be designed to work together. When several small programs can massage a data set into the right shape, it makes little sense to build one large one. A properly designed software workbench should support powerful ways to make tools work together without bothering the user about the details.

- Tools must have clean, well-defined interfaces. Users and programmers have a right to know precisely how a piece of code will transform its environment and how to read and understand the changes. All system data files should have formats that are clearly documented and, where possible, printable and readable by the human eye. All in-core control blocks and system data structures that could be in a user's address space should be documented well enough for a programmer to clearly understand the effects of modifying any field.

- Good tools help get work done with a minimum of fuss. Users quickly tire of gratuitous cuteness, cleverness, and chatter. If the user wants hand-holding it should be available, but nobody should be forced to live with it the 200th time around. Most tools should be activated by a single command, do their work in

silence unless the user needs to be told something, and exit without fanfare when the job is done.

- The requirements of users are complex and ill-defined, and they change over time. A properly designed operating system and utilities should be easy to modify and extend; it should support rapid prototyping, and it should include all the tools necessary to maintain itself.

- Tested tools, libraries, and program generators produce more reliable applications more quickly than hand coding, and design time is too precious to spend on reinventing the wheel.

A well-designed environment should provide power tools like sort utilities, pattern-matching routines and macro packages as part of the base that every program and system can count on.

- Good support for users' and programmers' personal working styles is more important than someone else's idea of the right way to do things. A user should be able to customize his or her interface to the system without having to mess with fragile parts of it, and the changes shouldn't be forced on everyone else.

Keeping these ideas in mind, let's look next at the organization and features of UNIX.

The UNIX Environment

The UNIX environment consists of a kernel and a set of utilities that are also called tools or commands. These are wrapped in a shell, the command language that a user sitting at a terminal sees.

Though a user sees the shell first and utilities second, and the kernel is almost entirely hidden from view, we'll look at these from the inside out in order to clarify some important points.

The kernel is the heart of the system; it alone knows how to talk to I/O devices, run programs, and change the memory map. The shell and utilities request services from the kernel through about 40 entry points that look to them like ordinary subroutine calls.

The entry points have been carefully chosen to isolate the utilities from the kernel's internal workings while imposing as little overhead as possible. They define a powerful, clean, and simple interface to the machine hardware. Conventional systems at UNIX's level of power tend to have literally hundreds of system calls, each one hedged about with restrictions and fussy protocols. UNIX's blessing is that its system interface is simple enough to be held in an ordinary programmer's mind.

Two UNIXes or UNIX-like systems are perfectly compatible when these entry points (or system calls) act identically in both. UNIX kernels tend to be very similar even across extremely different machines; thus utilities and applications tend to be extremely portable. Different dialects of UNIX and UNIX-like operating systems are defined by slight variations in the entry points.

The utilities are the programs that users invoke to get their work done. Typically these include:

- Compilers for C, FORTRAN 77, and Pascal;
- Two different line editors and a screen editor (ed, sed, vi);
- Powerful text formatting and typesetting tools (nroff, troff);
- Tools for searching for patterns in data (grep, awk);
- Tools for finding differences between files (diff, comm);
- Tools for semiautomatic maintenance of code systems (make, SCCS);
- Electronic mail and terminal emulation (uucp, cu, mail);
- Tools for examining and changing the file system, and for maintaining backup files.

These are all considered standard parts of the UNIX environment.

Unfortunately, many CLONIX vendors leave out important sets of these tools; they often claim to be "fully Version 7 compatible" when they only have Version 7-compatible kernels.

UNIX actually has no way of distin-

guishing user-written programs from utilities that come with the system—both communicate through that small set of kernel calls. Almost anything that can be done to the machine by a UNIX system utility can also be done (usually quite painlessly) by user-written code. This is important because it means users can tailor their systems gradually, without going through drastic reconfigurations or tricky changes to the kernel.

Finally, a shell is what the user sees when he or she sits down at a terminal. It's the command language from which users run programs, and it has powerful facilities for making groups of tools work together.

The most important thing to understand about any UNIX shell is that it's just an ordinary program that happens to know how to talk to users and how to call other programs; it's not an immutable element wired into the kernel as in most operating

systems. The system often comes with two or more different shells, each tailored to a particular style of using the machine; users can freely switch to whichever is most convenient in midsession.

One of the favorite claims of UNIX's competitors is that the UNIX interface (the shell) is terse, cryptic, and intimidating—and it's true that the so-called "Bourne Shell" that comes with UNIX is best left to programmers (though it's certainly no worse than CP/M or MS-DOS' command languages). What the competition misses is that writing and bringing up a user-friendly shell is easy and doesn't impair the usefulness of the original one bit. Bell Labs' latest System V version and many CLONIXes feature menu or window-oriented shells.

The UNIX File System

Another important organizing feature in UNIX is its file system. Much of the

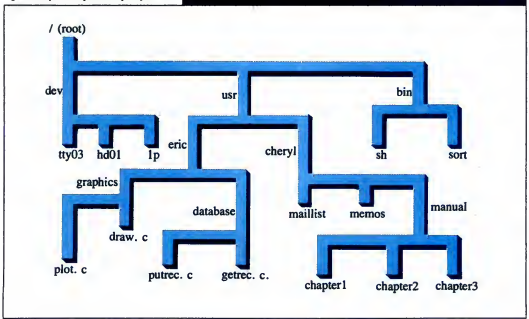
kernel is concerned with implementing it, and the tools and shell depend on it for much of their leverage.

The UNIX file system is shaped like an inverted tree. Directory (branch) and file (leaf) names can be 14 characters long and directories can have subdirectories in them; there's no depth limit. Directories are used to group related files together, so groups can have subgroups, which can have sub-subgroups, and so on. You only see the branches or leaves directly below whatever directory you happen to be looking at.

This freeform organization gives users a great deal of latitude in organizing files according to their use. Figure 1 shows part of a file system that holds the files for two users, Eric (a programmer) and Cheryl (a technical writer). Many files have been omitted for clarity.

Note that Eric can have two separate directories for his projects (the .c files are

Figure 1. A portion of a UNIX file system.



program source) and Cheryl has a directory devoted to her manual. Her "Chapter" could be a directory containing files that are text sections.

The slash (/) is used to separate the segments of a file name. Thus, the full name of Eric's draw routine is `/usr/eric/graphics/draw.c` and Cheryl's manual directory is named `/usr/cheryl/manual`. The slash that appears at the beginning tells the system to start the path at the root.

The full name of a file is seldom needed, however. The directories `eric` and `cheryl` are the "home directories" of these two users—the directories Eric and Cheryl will be looking at when they log on. From Cheryl's home directory she can refer to her Chapter 2 as `manual/chapter2` (note the absence of the initial slash; this search starts at her current directory). She can change her viewpoint with a "change directory" command

```
cd manual
```

and thereafter refer to Chapter 2 simply as `chapter2`.

Even if a user happens to be maintaining a very large number of files, this tree structure means that the files can be organized so that he or she has to see and think about only small sets of them at any one time.

UNIX's public commands live in the `bin` directory. The `dev` directory contains magic files that send output to and take input from various devices (terminal #3, hard disk #1, and the line printer are shown here).

Programmers will find the file I/O calls equally accommodating. An input device or file is something you can grab characters from, and an output device or file is something you push characters to. If it happens to be a block device, you can get to it through random/access without fuss. A program almost never cares what hardware the I/O is coming from or going to, and buffering is invisible. When you're done writing to a file, its size is just the number of bytes you wrote.

Plumbing

UNIX excels at putting small programs together to do big things. This is usually accomplished by using a shell (one of the many UNIX command languages) to fit them together.

Every UNIX and most CLONIXes support a standard shell called the "Bourne Shell." Most UNIX programs see the world as a collection of channels or byte streams. An input channel is simply something the program can grab characters from, such as a terminal keyboard, disk file, or joystick port. An output channel is something it can write characters to, such as a terminal screen, disk file, or line printer.

By convention, most UNIX programs are organized to take characters or text lines from a standard input channel, transform them in some way, and write the results to a standard output channel. This kind of program is called a filter.

The `sort` utility, for example, takes a file of text lines from its input, sorts the lines into ASCII collating order, and

```
$ sort <animals
```

This sets up the shell to get its input from the file (read the `<` as "from" or "source"). It produces the same output as the previous command; however, the command

```
$ sort <animals >zoo1ist
```

would sort the animals file into a file called "zoo1ist" (read the `>` as "to" or "target").

The important point about the `<` and `>` signs is that the shell interprets them, not the program. They work with any filter and will connect it to any files or devices on the system. Thus,

```
$ sort <animals >/dev/lp
```

will send the sorted contents of the animals file to the line printer (which, as far as the Bourne Shell and most of UNIX knows, is a file in the `/dev` directory of devices).

Typically, though, you wouldn't send output direct to a line printer; you'd need a print spooler between you and it. Most UNIX-like systems have one, a filter

AT&T will begin to move into hardware this year, possibly by the time this article reaches print, and new UNIX versions will be among its major weapons.

writes them to its output. By default, standard input is the keyboard and standard output the screen. The user can type in lines and see them sorted immediately.

Though the use of the `sort` utility shown in Figure 2 is interesting as a demonstration, it's not very useful. We typically want to sort files rather than input data by hand. We can do this with the following, assuming "animals" is a file containing the text lines in the example:

that's usually called `lpr`. The right way to do this is:

```
$ sort <animals | lpr
```

This tells the shell that you want to connect the output of the `sort` operation to the input of `lpr`. The `|` symbol is pronounced "pipe," and this kind of command is called a "pipeline."

If you often need hardcopy of a sorted list of records (a mailing list might be a

good example), this pipeline can be packaged into a script by putting the line

```
sort <$1 | pr
```

into a text file (let's call it `prlist`).

With one more simple command to tell the system that `prlist` is a new command (`chmod +x prlist`, for the curious) you can set things up so that when you type

```
prlist myfile
```

the shell will execute the text in the file, substituting `myfile` for `$1`.

If your script contained `$2` or `$3`, the shell would substitute any second or third argument given to the command. Up to nine arguments can be given this way.

From then on, `prlist` is a command just like any other one. It's common under UNIX for applications to be written as scripts calling collections of UNIX tools and custom-written small programs, because this is often cheaper and easier than writing one big program.

The shell was designed with this in mind, and has many facilities not shown here. It's actually a powerful interpretive programming language with `if-then`, `while-do`, `for`, and `case` statements like those of C or Pascal.

As we've seen above, UNIX supports a very powerful set of tools for use by hand or in scripts. When harnessed together by the shell's control language, these tools can perform major application tasks with minimal programming effort. The classic example of this is the pipeline

```
tr A-Z a-z : tr 'a-z' 'j'
| sort -u
| comm -2 dictionary
```

which, believe it or not, is a spelling checker. It accepts an input stream, maps all letters to lower case, and maps all non-letters to newlines (carriage return/line feed pairs), which turns the file into a one-per-line wordlist. It then sorts the list and removes all adjacent duplicates, compares the result to a dictionary word list, and prints out only those tokens in the input

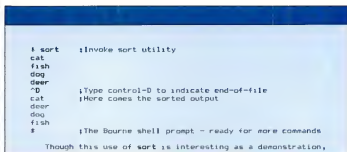


Figure 2. A demonstration of UNIX's `sort` utility. Bold text is user input, plain text is UNIX output, and semicolons are placed before comments that would not be typed or seen in the actual session.

that didn't match.

If this example leaves you feeling a bit breathless, think about the discussion of the pipe bar above and look again. You'll get it.

Problems With UNIX

UNIX documentation for a feature traditionally ends with a section boldly entitled "Bugs." This may seem gauche, but the UNIX attitude is that users will trust a tool with known and stated limitations over one that promises the moon and then fails due to a bug that's been swept under the rug.

I've mentioned that some CLONIXes leave out important utilities. Usually this is either the result of a misguided notion that only programmers need them, or part of an apparent bait-and-switch tactic that promises UNIX power and then makes a substantial part of it an extra-cost "option."

Users should learn to demand a full set of tools in order to get full UNIX power. This should be a priority even for those who never develop software, since applications should be able to count on having all the standard tools around to use as components in scripts and pipelines.

UNIX isn't good at real-time applications. Its task scheduler is set up to be "fair"; that is, no process can be indefinitely denied a chance to execute. Unfortunately, this also means that you have no

way of guaranteeing that a time-critical process like a communications handler or data-acquisition module will be able to get the processor's attention often enough.

UNIX has no standard facilities for locking records in files. Bell Labs has sponsored a proposed standard for a record-locking call, and this may find its way into a release in the near future.

Many UNIX systems are poor at enforcing resource quotas. There's no standard way, for example, to limit the amount of disk space a task can use.

Most CLONIXes have calls that address these problems, but the calls don't tend to be portable. Future releases of Bell's UNIX (System VI and up) will undoubtedly set standards for solutions.

Even with these problems, UNIX is an excellent base for most personal and business applications.

UNIX As a World Standard

This January saw the largest UNIX conference ever—UniForum '84 in Washington, D.C., had more than 7,500 attendees. Six days before, IBM had dropped the other shoe by announcing PC/IX—a full System III UNIX for the PC-XT or PC plus extender. The announcement took on extra significance against a background of widespread rumors of a falling-out with Microsoft over design errors in MS-DOS, and following IBM's refusal to endorse Microsoft's *Windows*.

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As with the PC, Big Blue's mere presence changed the rules. UNIX has arrived and that means that MS-DOS has lost the high end of its market.

DEC's long-awaited announcement at UniForum of formal UNIX support for its PDP/11, VAX, and Professional computers drove the point further home. In the very near future UNIX will serve as a common general-purpose operating system for everything from personal micros to large mainframes, across all major hardware lines.

Even today, UNIX or UNIX work-alikes also run on architectures including Intel 8086 and 80286, Z8000, MC68000, NS16032, or LSI-11 based micros; Perkin-Elmer, Gould, Data General, and Prime minicomputers; IBM Series/1 and Amdahl V-series mainframes; and the Cray-1 supercomputer. The list grows monthly. Software portability and standardization will become a reality and computer end users will benefit enormously.

The surprises aren't over yet; there's one major player in the UNIX market that has yet to show its hand. AT&T, hungry for a big chunk of the computer and telecommunications business, announced Release 2 of System V at UniForum. This is the most advanced UNIX yet and makes clear AT&T's determination to develop its product aggressively.

AT&T will begin to move into hardware this year, possibly by the time this article reaches print, and new UNIX versions will be among its major weapons. It will probably end up head-to-head with IBM for market share. And the one party guaranteed not to lose in the resulting battle of titans is the consumer.

In this issue, you'll find reviews of XENIX, QNX, and Idris. Look for reviews of VENIX, PC/IX, uNETix, and the COHERENT operating system in PC, Volume 3 Number 11.

Eric Raymond is a software designer and programmer/analyst at Rabbit Software Corporation in Malvern, Pennsylvania. He owns a very low-numbered PC.

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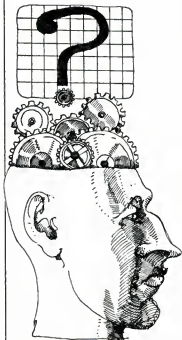
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U N I X

Understanding UNIX

UNIX is a good bet to become the operating system of the future, but it can be difficult to learn. This introduction to the world of UNIX should help ease the transition.



UNIX presents the user with an intimidating number of specialized terms and concepts. This introduction is intended to lower that intimidation factor, initiate the reader into UNIX, and help explain some of the terms and program names you'll encounter. It should give you a chance to get a taste of this increasingly important operating system with a bit less frustration than you might expect.

First, let me summarize the differences between UNIX Version 7 and PC-DOS Version 2.0. UNIX is a multiuser, multi-

tasking operating system (it can handle more than one person, or one program, at a time), while PC-DOS is a single-user operating system. Also, UNIX distinguishes between upper- and lower-case commands and file names, while PC-DOS does not. Finally, UNIX file names can have more than the single period allowed in DOS.

UNIX's multi-user capabilities mean that a number of added file characteristics determine who has access to a file and how it is accessed. Access types include read, write, and execute. Each user has a

user ID (name) and a group. You set access for a file based on the following user levels:

- Me—what you can do to a file;
- Group—what your group can do;
- Other—what anyone else can do.

Note that, just as PC-DOS does, UNIX treats subdirectories like files so you can easily restrict user access to whole subsystems of your database.

The UNIX Environment

Most versions of UNIX supply a large number of programs as standard equipment, while PC-DOS comes only with BASIC, a line editor, a debugger, a shell, and a few utilities. (The shell in PC-DOS, called COMMAND.COM, recognizes commands such as DIR, ERASE, COPY, and PATH; executes batch programs; and handles I/O redirection.)

UNIX, on the other hand, generally comes with more than 100 programs. These can be organized into overlapping subsystems. There's no way I can describe all UNIX standard programs, so I'll try to summarize the important subsystems.

The most important program in UNIX is the shell. It handles all your interactions with the operating system. UNIX generally comes with one of two shells.

The Bourne Shell is the standard shell. It can run batch programs and expand wildcard characters such as asterisks and question marks for search programs, but not a whole lot else. Commands such as COPY, DIR, TYPE, and ERASE are distinct programs and not part of the shell. The batch program facility is very sophisticated, with *if/then/else* statements, *case* statements, and a number of other nice constructs.

The C shell is a Berkeley enhancement (developed at the University of California at Berkeley, not at Bell Labs). It adds the ability to repeat/edit previous commands, a smarter batch processor, and some other nice features.

UNIX should always come with language support. Generally, C language, an assembler, and a debugger are supplied.

Other languages often found on UNIX systems include BASIC, SNOBOL, and FORTRAN77.

Written in C

UNIX comes with C because it is written in C. Thus, if you want a program to interact with the operating system (to allocate space, read a file, create and talk to other processes), C is the natural choice. C requires an assembler compatible with the machine it's being run on, so an assembler is usually included.

UNIX uses the *ob* and *lint* programs to help create C code. The *ob* program is a C code beautifier. It automatically supplies the proper indentation according to the level of the program. It can produce something that looks like structured code from any sort of program. A program verifier, *lint*, checks for syntax errors, probable mistakes, and nonportable code.

UNIX also often includes two not-quite-languages: *lex* and *yacc*. The first,

lex generates C language programs for lexical analysis of texts and yacc is a compiler-compiler.

lex, generates C language programs for lexical analysis of texts. The second, *yacc*, is a compiler-compiler that turns regular expressions into C code. It takes a program written in a context-free grammar and produces a set of tables that handle parsing (finding noun-verb-noun constructs and interpreting them, for example). In other words, it is a compiler that produces code for another compiler.

Communications is one of UNIX's strong points. Most microcomputer UNIX systems tend to give you a stupid terminal program and two smart networking pro-

grams including the following:

- *cu* (Call UNIX)—This is the dumb terminal program. It may have the ability to autodial, and then act as a terminal.

- *uux* (UNIX to UNIX execution)—This program treats external UNIX systems as if they were another branch on the directory tree.

- *uucp* (UNIX to UNIX copy)—This lets you copy files in a batch mode type of arrangement from a remote UNIX system. It's handy for companies with branches.

Also provided with UNIX are mail and message programs. Mail programs send mail to users who may not be on-line. Message programs communicate with users who are on-line. You can instruct UNIX to alert you if it has received incoming mail for you.

Text Editing

A line editor (*ed*) is standard, but most versions of UNIX nowadays have some sort of full-screen editor. Since UNIX needs to be able to communicate with a terminal as well as the PC, full-screen editors are generally slower and less convenient than well-written PC-DOS editors. The single-user PC/IX has a PC-dependent editor since PC/IX does not support attached terminals.

The most common full-screen editor is *vi*. As an editor, *vi* is a whole lot better than *ed*, but not nearly as good as the best PC-DOS has to offer. Along with *vi* you often get a changeable file (*termcap*) with definitions for all the terminals you might connect, and *curses*, a significant set of subroutines for manipulating a user's screen from within UNIX, irrespective of terminal type.

A spelling checker (*spell*) and two on-line help facilities are also available. The *help* command prints a one-page summary of a UNIX program, while *man* prints out the user's manual for that program. Some implementations also have a news facility for maintaining news about the system.

UNIX has a number of facilities for text formatting. First among these is *nroff*, a

versatile text formatter that allows macro definitions. It processes a text file by interpreting dot commands (lines that begin with a period or dot). Dot commands can specify right/left justification, line spacing, indentation, underline/boldface, headings, macros, and multiple fonts. A macro combines a set of `nroff` commands under a single name. Like batch programs, it allows for variable substitution.

Along with `nroff`, UNIX may also have filters, preprocessors, and supplied macro definitions. A preprocessor takes a file with special commands and translates these commands into dot commands that `nroff` can understand. There are two common preprocessors.

Math Preprocessor

The `neqn` preprocessor is used for simple definition of mathematical equations. For example, the lines:

```
.EQ
lim from {n -> inf} sum from 0
to n x sub i
.END
```

will result in a large number of lines, suitable for `nroff`, displaying an infinite sum in mathematical notation.

The `tbl` preprocessor is used for creating labeled tables of information. It formats columns and column headings.

The `ms` manuscript macro file contains a set of macros used by `nroff`. To the user it appears as if a new set of dot commands has been added. Some of these provide for multicolumn output, headers and footers, footnotes, italics, floating keep (to keep paragraphs from splitting onto two pages), section headings, and boxes around text. A more powerful version of `nroff`, called `troff`, may also be available. Designed specifically for phototypesetters, `troff` includes dot commands for print sizes, space between characters, and many different character sets. PC implementations of UNIX rarely have much use for `troff`.

(continued)

SPECIAL REPORT A Glossary of UNIX Terms

This explanation of UNIX jargon should help take some of the mystery out of the operating system.

adb: A general debugging command for UNIX files.

as: A command that assembles UNIX files.

at: A command that holds a file for execution at a later time.

awk: A command that scans files for specified patterns.

Berkeley enhancements: A set of UNIX utilities that were developed at the University of California at Berkeley. They have become more or less standard on mainframe UNIX implementations and are now starting to show up on microcomputer implementations.

bin: An abbreviation for binary object files; directory `/bin` stores UNIX utility files.

bc: A command that provides interactive processing with a precision arithmetic language.

Bourne shell: A shell used in UNIX System 7.

bc: A compiler for a language that combines features of BASIC, COBOL and C, for rapid program development.

C shell: A shell especially suited for C programming; part of the Berkeley enhancements.

cal: Prints a calendar for a specified year.

cb: A C program beautifier; displays C program structure on the standard output device.

cd: Changes working directory.

chdir: A command that changes the working, or default, directory, the same as the `cd` command.

cmp: A command that compares two files.

comm: Selects or rejects lines common to two files.

cp: A file copy command.

cron: Invokes system clock for use by programs.

crypt: Encodes and decodes files.

csh: Abbreviation for C-shell.

cu: A command to call up another UNIX system or a terminal.

curses: A library of cursor-control functions for C programs.

(continued)

UNIX also contains a program to generate business graphics. This program, called **plot**, is less versatile than the graphics contained in **BASICA**, but more than adequate for most common applications. A set of drivers for devices such as Tektronix displays and graphics terminals is often included. Both **VENIX** and **PC/IX** have drivers for the IBM color card. No specific devices are needed to use **plot**.

Utilities

UNIX comes with a large set of utilities designed to make life simpler. These include:

- **bc** and **dc** —These are desk calculators that are far more powerful than that description implies. They treat numbers as character strings, which means virtually limitless digits of precision. Second, they include programmability, with variable names and structured constructs such as **if/then/else**, **do/while**, and **case** statements.

These calculators are particularly useful because, with UNIX's multitasking ability, most programs can be temporarily suspended to let you run **bc**, get a numerical answer, and then continue the program. This is similar to the desk calculator feature of Apple's **Macintosh**, but far more powerful.

- **awk** —This is a pattern scanning and processing language. It enables extremely complex transformations of files using a terse, consistent syntax. The language can, for example, be used to sum up columns of a database, remove nonunique records, find certain rows of a database and perform mathematical operations on them, exchange fields, and perform validity checks. Complex enough to require its own user's manual, **awk** usually comes with one.

- **cal** —This is a small calendar printing program.

- **cmp**, **diff**, **comm**, and **diff3** (**Compare**, **Difference**, **Common**, and **Difference among 3 files**)—These are utilities to let you compare two or three

UNIX GLOSSARY (continued)

dc: Desk Calculator. A command to call an arbitrary precision arithmetic package.

dev: An abbreviation for I/O devices; the **/dev** director lists special device files in UNIX.

diff: Tells what lines must be changed in two files to bring them into agreement.

diff3: Like **diff**, but compares three files.

dir: An abbreviation for directory, used in many UNIX commands.

e: Editor.

ed: The standard text editor.

egrep: Extended **grep**, accepts full regular expressions.

erase character: A special character that, when received from a terminal, is deleted along with the character preceding it.

eqn: A mathematics typesetting command.

ex: A text editor.

filter: A utility that filters specified data from a file.

grep: Searches a file for a pattern.

help: Accesses a library of help screens.

INed: Text editor for **PC/IX**.

large memory model: A way that 8086 programs can use a full megabyte of memory.

learn: A computer aided instruction program about UNIX.

lex: A lexical analysis generator.

library: An archive of object files.

lint: A C program verifier.

lpr: A command to print a file.

mail: Sends mail to designated users.

make: Maintains program groups.

man: Prints a section of the UNIX manual.

middle memory model: A way for 8086 programs to utilize random access memory; compare to small and large memory models.

micnet: A networking program.

mkdir: makes a directory.

(continued)

UNIX GLOSSARY *(continued)*

mm: Formats common office documents, such as letters and memoranda.

ms: Manuscript formatting macros.

neqn: Typesets mathematics on a terminal.

nroff: A text formatting utility.

pipe: A direct input/output connection between processes.

profiler: An option shell script that establishes the working conditions customary for a particular user.

root directory: A distinguished directory that establishes the hierarchy of all directories in a system.

rmdir: Removes directories.

SCCS: UNIX Source Code Control System, utilities for large-scale software development.

sed: A stream editor.

shell: The program that causes other programs to be executed on command.

shell script: A file of commands taken as input to the shell.

small memory model: A way for 8086 programs to fit code and data into a minimal amount of memory.

SNA: System Network Architecture, an IBM communication protocol.

spell: Finds spelling errors.

stty: Sets terminal options.

style: A set of programs that check text for common writing and style errors.

tbl: Formats tables.

termcap: A library of terminal capabilities.

tploft: A graphics command for placing ASCII characters on the screen.

troff: A text formatting utility for phototypesetters.

uucp: A utility that copies files to and from a remote system.

uux: A utility that executes commands on a remote system.

vi: A visual text editor, part of the Berkeley enhancements.

xon: ASCII character (ctrl-Q) to initiate data flow.

xoff: ASCII character (ctrl-S) to suspend data flow.

yacc: "Yet another compiler-compiler;" converts context free grammar into tables for parsing algorithms.

different files. The **cmp** utility works with all files (not just character files), **diff** and **diff3** work with character files to find lines that have changed, and **comm** finds lines common among three files.

• **sed** — This is a stream, or batch editor. Using the output of **diff** as an input to **sed**, you can recreate an earlier program and maintain only a list of changes instead of the entire earlier version.

• **grep** and **egrep** — These are pattern matching programs. In their simplest form, they merely look up words (just as the PC-DOS **FIND** program does). In operation, they work like the search commands of a DOS text editor, with end-of-line/start-of-line characters, searching for one of a bunch of characters, and so on. For example,

```
grep 'FILE[0-9]' * .c
```

will search all files with the suffix **c** for a string, **file**, followed by a single digit. You can use **grep** with **sed** to perform search and replace operations that are as sophisticated as those of any text editor.

• **crypt** — All mainframe users need to worry about security. Utilities such as **crypt** allow you to encrypt and decrypt files using a key. Some versions of UNIX also have a mail facility that lets you encrypt and decrypt electronic mail using public and private key systems.

UNIX has a full complement of file and user maintenance programs. These work like **COPY**, **DIR**, and **ERASE**, but with a host of additional features. User maintenance lets you see who logged in, how long they were on, and which programs they ran. This is handy in a mainframe environment and for billing. For example, all work billable to a specific job can be logged in under a job-specific name, simplifying the process of determining charges that apply to particular projects.

Armed with this background information, the mysteries of UNIX shouldn't seem so impenetrable. The rest of this two-part special report will tell you more about UNIX and some of its implementations and lookalikes. ■

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Taking the Cue from UNIX

QNX is a new multitasking, multi-user operating system for the PC. Although it's designed around UNIX tenets, it's both more and less than another UNIX lookalike.

Do you know that your PC spends most of its time waiting for you to enter commands? While your brains are working in overdrive, your idle PC is quietly humming. Unless you're a speed typing champion, your PC has a lot of spare time on its hands, but you can keep it occupied by using a multitasking operating system—that is, one that can run several programs simultaneously.

QNX from Quantum Software Systems, Inc., of San Jose, California, is one

of several new multitasking, multi-user operating systems for the IBM PC that are based on Bell Labs' UNIX. Although QNX is built around the four UNIX tenets—C language, a hierarchical file system, multitasking capability, and device independence—it's both more and less than just another UNIX lookalike.

Don't pass up QNX simply because it's not UNIX. While the UNIX operating system is a great achievement, it isn't flawless. For one thing, micro versions of UNIX can be overwhelming. Does a

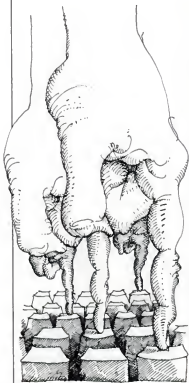


Illustration: Joe Cardello

micro really need all that power?

QNX comes on two disks. One includes the system and about 50 utility programs; the other includes the C compiler and program libraries. A separate package contains a demo disk. QNX will run on a PC with a single drive and only 128K RAM, but Quantum recommends larger hardware configurations. One of QNX's important advantages over the UNIX lookalike crowd is its ability to run on a modest PC without a hard disk.

The QNX package includes two clear and well-written manuals, one for the operating system and one for the C compiler. Several introductory chapters are followed by a section that provides one page of description for each command.

Poking Around the Demo

The best way to gain an appreciation of QNX is to try the demo disk. It runs benchmark programs, runs several programs simultaneously and demonstrates the QNX menu system. For some reason the demo requires 256K RAM, twice the amount that QNX itself requires. The demo has several other surprises, so observe carefully and be sure to poke around.

If you've run the demo disk and decided to give QNX a whirl, your first chore is to make backups of the two distribution disks. Be careful—page 3 of the manual claims that these disks are write-protected, but mine weren't and I came within a nanobit of erasing them while shuffling disks in and out to format a pair of blanks.

Another interesting thing happened while I was copying my distribution disk. I encountered error messages indicating that two blocks were unreadable. (This may have been a hardware problem, not a media problem.) Great, I thought, a chance to test QNX's `dcheck` utility, (which checks disks for errors). Unfortunately, `dcheck` claimed that the disk was fine. QNX lacks a program to identify the files that contain the suspect blocks, so I still don't know if I actually have bad

blocks on my distribution disk. QNX is also missing a program to check the logical structure of a disk. Hierarchical file systems can become corrupt; blocks can become orphaned; in QNX I'd never know. QNX obviously needs its own version of the PC-DOS `CHKDSK` program or the UNIX `fsck` program. Even worse, QNX doesn't have a program to fix a broken file system.

QNX does have about 50 UNIX-like utility programs, including the usual commands to display text files, list files, move from one directory to another, delete files, rename files, and copy files (see Figure 1). A `task` command prints a list of the current tasks and a `who` command lists the active users. Other commands search for patterns in text files and list the number of lines and characters in files. By UNIX standards 50 is a mere handful of commands—UNIX has over 200. However, all 50 of QNX's commands fit on a single floppy—a definite advantage.

QNX also has two text editors: `ed`, a screen-oriented editing program, and `led`, a UNIX-style line editing program. The `ed` program is unique but fairly simple to use once you learn how to switch

from command mode to text entry mode. The `led` program is a simplistic word processor; it doesn't have the features of *WordStar* or *Word*, but it works. I prefer `led` because it is similar to the ubiquitous UNIX editor and I'm tired of learning new text editors.

The system lacks a UNIX-like command interpreter. Its own command interpreter, called the shell, performs only about 10 percent of the functions of the UNIX shell. There are no flow-of-control, variables, job control, history, or aliases, and only a meager environment and pipelines.

Another missing ingredient is wildcards. Although QNX's `ls` command is similar to PC-DOS' `DIR`, you can't enter commands such as

```
ls *.c
```

because QNX doesn't know that `*.c` matches any file name with the suffix `.c`. QNX does have a way to run commands on groups of files but it's too painful to discuss.

PC-DOS Compatibility

QNX and PC-DOS are radically differ-

What is Multitasking?

This familiar-sounding word is frequently misunderstood. It may sound a bit like black magic, but in fact it has a simple meaning.

Multitasking is one of those familiar-sounding words that few people can define. It simply means that the computer can do several different tasks at once.

PC-DOS is an example of a single-tasking system; it runs only one program at a time. QNX can run several programs simultaneously.

Multitasking isn't black magic—it's been around almost as long as comput-

ers. The type of multitasking that's used on micros is called "time sharing." The computer switches from one job to the next several times each second, so rapidly that it creates the illusion that it's doing several things at once. The process is similar to watching a movie—we all know that movies are just a series of still photographs, but the pictures are flashed on the screen so rapidly that we perceive motion.—K.C.

ent systems, but there is some degree of compatibility between them. QNX has a utility that can read and write files from DOS 1.1 floppy disks, although this utility can't read files from a DOS-format hard disk or from a 2.0 disk. On an XT you have to run QNX's DOS utility from the hard disk because it doesn't work with a single floppy drive as both source and destination. The command worked as stated, but there are far too many ifs, ands, and buts. In addition, there is no PC-DOS program that can decipher a QNX disk. According to the manual, you can partition a hard disk into two pieces so that QNX can share it with PC-DOS, but I didn't test this feature.

The major difference between QNX and PC-DOS is QNX's ability to run a process in the background. You can run the compiler while you continue to test an old version of your program. You can run a background job that computes π to umpteen digits of accuracy while in the foreground you edit a treatise on numerology. QNX automatically runs a background clock program that writes the time and date in the upper right-hand corner of the screen without appreciably detracting from the system performance. You could write such a clock program in PC-DOS, but not without resorting to tricks. In QNX, the clock program is simply an ordinary program that runs continually at low priority.

Although QNX's multitasking capability is outstanding, Quantum would have a stronger product if it adopted PC-DOS 2.0's file structure. I'm not aware of any technical advantages to the QNX file system. Incidentally, if you perform PC-DOS DIR of a QNX disk, it looks like a blank. Be careful.

So far, the only major products for QNX come from Quantum. Currently, the system is looking for systems developers, not end users. Thus one of the most important aspects of QNX is the quality of its programming tools. Quantum claims that FORTRAN and BASIC are available, but they weren't supplied with the review sys-

Don't pass up QNX simply because it's not UNIX. While UNIX is a great achievement, it isn't flawless. For one thing, micro versions of UNIX can be overwhelming. Does a micro really need all that power?

tem, and I didn't test them. However, the review material did include a C compiler.

QNX is free to adapt from UNIX as it pleases, but C is C and QNX should be judged by its adherence to the standard stated in Appendix A of *The C Programming Language* by Brian Kernighan and Dennis Ritchie (Prentice Hall, 1978). The QNX C manual acknowledges two shortcomings in this version: the #IF is limited constant, and the initialization syntax for structures is slightly off. Neither problem is major.

A more serious problem is the lack of software floating-point support. All floating points in all QNX languages require the 8087 coprocessor, although the 8087 is an option that few PC users have purchased, the chip is not even available for some PC compatibles. On most PCs, QNX C is therefore an integer subset of C—a major shortcoming for some applications.

QNX includes the standard I/O library, but its designers have omitted the deeper I/O routines (read, write, open, creat, close, lseek) that are an essential part of any C environment. In the past, C compilers have tended to omit the standard library while including the six routines mentioned above, but I've never encountered the reverse.

There's one more shortcoming before I get to the good news. A vital part of C is the preprocessor; programmers need to look at the preprocessor's output to find many insidious bugs. The QNX C compil-

er is the only one I've used that doesn't allow you to look at preprocessor output.

The good news is that this C compiler produces extremely small load modules, often five to ten times smaller than I would expect. It does this by decoupling the subroutine libraries from the load module. The libraries are resident in memory and shared by all programs. This concept has been used before on larger computers, but I've never seen it on a micro. The extremely compact programs make it possible to place QNX's 50 utilities on a single floppy disk and make it possible for the QNX system to work on a machine with 128K and floppies. Thus, QNX can fit more programs in memory at once. In short, this feature of the compiler is the major attraction of this system.

Throughout my evaluation QNX worked reliably. It never crashed; it never hung up. The only problem I encountered was the pair of bad blocks while backing up the distribution disks. I ran programs in the background, edited and compiled programs, and I even got a friend to log in and work using a remote terminal while I used the system console.

QNX can provide an excellent base for specialized applications. QNX would be an excellent operating system for a PC used to control a scientific experiment or an industrial process. You could construct a bulletin board system that would handle six or eight phones simultaneously. QNX would also be an ideal system manager for a group of networked PCs. ■

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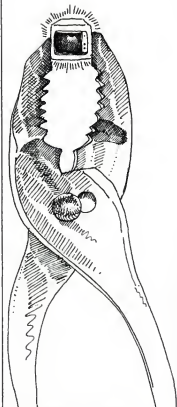
A UNIX to be Proud Of

Microsoft's XENIX is a complete version of UNIX that includes all the enhancements and added features developed at Berkeley. But don't look for much speed or any games.

XENIX, Microsoft's version of the UNIX operating system for the PC, is UNIX by another name, and its smell is at least as sweet. UNIX, originally developed at AT&T's Bell Laboratories, has become popular over the past decade because of its power, versatility, and universality. XENIX is an enhanced version of Bell Laboratories' UNIX System III. The word "enhanced" refers mostly to the additional UNIX utility programs written at the University of California at Berkeley, which are included in XENIX. The most impor-

tant of these programs are the `ex/vi` editor, the `csh` command interpreter, and the `style` text analysis program. The Berkeley enhancements, which are well regarded in the UNIX community, aren't available in most other versions of UNIX for the PC. In addition to these enhancements, XENIX includes the `uucp` and `miconet` programs, which permit you to set up PC networks.

Rather than selling directly to the user, Microsoft usually sells XENIX to other companies that customize the software for particular hardware systems. The Santa



Cruz Operation, Inc., of Santa Cruz, California, is adapting XENIX for the PC. The complete SCO XENIX costs \$1,350. You can also purchase the system in three pieces—the XENIX Operating System for \$595, the XENIX Software Development System for \$595, and the XENIX Text Processing System for \$495. The system that I reviewed was a beta test version of the complete SCO XENIX. It had a number of bugs and glitches that should be gone now that it is officially on the market.

XENIX runs on a PC-XT or a PC with a hard disk expansion. It requires at least 256K RAM, but it's more appropriate to use it in systems with at least 512K. You do not need any hardware additions or modifications to run XENIX.

Because XENIX contains about 200 separate utility programs, I can't comment on (or even try out) each one. I have relied on my knowledge of UNIX to focus on the more important features and to give you an overview of the system as a whole.

Software Bundles

The kernel of the system is the XENIX Operating System. The XENIX Software Development System and the XENIX Text Processing System are optional extensions. Without the two extensions you still have a serviceable operating system, but I would be hard pressed to call it a UNIX system. Nonetheless, the advantage of purchasing only one or two of the pieces is that you save space, leaving more of your overburdened 10-megabyte disk for your own files.

XENIX Operating System. This contains the UNIX kernel and about 150 utility programs. Take heart—you don't have to learn them all; only a dozen or two of the utilities are everyday tools for most people. If you've used PC-DOS 2.0 you're already familiar with some XENIX tools, such as `mkdir`, `rmdir`, and `cd`. They're PC-DOS 2.0's borrowings from UNIX. In addition, XENIX contains the usual assortment of programs to copy, rename, and remove files, display the date, and print files.

Some of XENIX's utility programs would not work under an operating system that will not permit multitasking—running several programs at once. For example, the `at` command can set the system to run a program at a specific time, and the `cron` command will set it to run programs periodically. Single-task operating systems such as PC-DOS cannot deal with time delays of this kind.

The XENIX Operating System module comes with the visual-mode `ex/vi` text editor as well as the more traditional `ed` line-oriented text editor. A full-screen editor, `vi` is adaptable for use on a wide variety of terminals. The same `vi` screen editing commands that I use on large-scale, UNIX-based systems work perfectly under XENIX. It takes several seconds to load `vi`, but it works very responsively once it's running. You'll also be able to use the screen editing features of `vi` if you hook up remote terminals to your PC, using it as a multi-user "microframe." Ultimately, `vi` is more of a text editor

`vi`, the XENIX text processor's formatting features are meant for writing a book or a manual or preparing camera-ready materials.

The XENIX text processor also comes with a typesetter driver. You can prepare text for typesetting using XENIX and then ship your document to a UNIX-based typesetting system.

The XENIX Text Processing System contains the `tbl` program for formatting tables and the `eqn` program for working with equations. It also has a program for checking your spelling and a word counting program that tells writers when they've said enough.

One interesting feature is `style`, a program that analyzes your writing style. The `style` program computes the reading level of your material, categorizes and catalogs the types of sentences in your writing, and can be set to flag especially long sentences (such as this one). The XENIX Text Processing System also includes `diction`, a program that

Rather than selling directly to the user, Microsoft usually sells XENIX to other companies that actually customize the software for particular hardware systems.

than a word processor; however, true UNIX-based word processors should be available soon from third parties.

XENIX Text Processing System. UNIX's Text Processing System is renowned for its powerful features, most of which XENIX includes. It has over 20 separate utilities. This system is not meant for preparing simple documents; using one of the PC-DOS-based word processing programs would be better for writing a letter. Used with a text editor such as `ex/`

searches for troublesome phrases. The `style` and `diction` programs are not available on most UNIX systems—their inclusion in XENIX is a nice touch.

XENIX Software Development System. UNIX owes its current popularity to scores of programmers who have discovered the joy of programming under it. Some of the most advanced software is written using UNIX, including much of the software written to run under PC-DOS. UNIX is becoming the dominant

system in most universities, and it is the system of choice in many advanced fields such as computer graphics, Very Large Scale Integration (VLSI) circuit design, and image analysis.

The XENIX software system contains a C compiler, the `lex` and `yacc` program generators, the programs `make` and `cc` for maintaining software, and about 40 smaller utilities. My favorite programming utility is `lint`, a program to check your C programs. XENIX includes all of the usual subroutine libraries as well as the `curses` library for creating programs that make heavy use of the screen. The C compiler can use either C's small memory model, which can handle programs of a normal size, or C's middle memory model, which is for very large programs.

I tested the Software Development System by transporting a communications program to the PC. It worked so smoothly under XENIX that it gave me little chance to test the robustness of the programming tools.

My review copy of XENIX included a total of 19 floppy disks. Two floppies were for booting and the remaining 17 contained the software.

Installation took about an hour, less time than to decommission PC-DOS. SCO did not supply a printed list of what is on each installation diskette, which was a problem when a colleague accidentally erased the `spell` program from my hard disk—we had to search through about a dozen diskettes before we located the original.

SCO also doesn't provide any guidance for users who would like to reclaim a little hard disk space by discarding little-used XENIX utilities. For example, you could save about 300K by deleting the `dictionary` program and the dictionaries that it consults. A list that identified the least used and most dispensable utilities would be appreciated.

Microframes and Networks

Like UNIX, XENIX is a true multi-user system. You can connect terminals to

the serial ports on your PC and let several people use the system simultaneously, turning the PC into a "microframe." The PC performs adequately when it's running a couple of programs at once, transferring information at 1200 baud.

Although most PCs with XENIX will probably be used by single individuals, even an individual can benefit from XENIX's ability to run several programs simultaneously. The UNIX command lan-

guage allows you to run a program unattended while using the computer for other functions that do not require interaction. Its ability to automate networking is one of the answers to the question "Why UNIX?" In simple systems such as PC-DOS that cannot handle multitasking, it's very hard for one system to automatically talk to another system. You can use PC-DOS for user-supervised manual networking, but because PC-DOS does just one thing at a time, it's hard to automate the function. In UNIX, a program named `uucp` passes information from machine to

The UNIX command language allows you to run a program unattended while using the computer for other functions that do not require interaction.

guage allows you to run a program unattended while using the computer for other things. This feature of the UNIX operating system is particularly useful for functions that do not require interaction, such as printing.

An even better way to monitor several programs is to use XENIX's "virtual consoles"—its most exciting new feature. Using this feature, you can switch the screen and keyboard of the PC from one task to another with a single keystroke. It's as if you had ten different terminals on your desk. You can thus work with two interactive programs at once without prompts and error messages from one program interfering with the screens of the other. For example, you could run a compilation on one virtual console while editing on another. UNIX has always had facilities for running several programs simultaneously, but not as conveniently as it can be accomplished with XENIX's virtual consoles.

Another important use of XENIX's multitasking software is to set up PC net-

work. Its ability to automate networking is one of the answers to the question "Why UNIX?" In simple systems such as PC-DOS that cannot handle multitasking, it's very hard for one system to automatically talk to another system. You can use PC-DOS for user-supervised manual networking, but because PC-DOS does just one thing at a time, it's hard to automate the function. In UNIX, a program named `uucp` passes information from machine to

machine using serial connections, usually over the phone. The process is relatively automatic—`uucp` looks up the phone numbers of the remote systems, calls them, logs in, transfers the information, passes further instructions to the remote machine, and then logs off. If it gets a busy signal, `uucp` tries again later. It can also make its calls late at night and can be accessed by other programs (such as mail).

XENIX contains `uucp`, but it also contains a similar set of programs called `minet` that is easier to use in small networks that are connected by cable, such as a group of PCs in an office. All you need to do is connect the serial ports on your PCs. The set of `minet` programs is a little easier to set up than `uucp`, and it avoids some of the security problems of dial-up networks.

The UNIX mail program will work with either kind of network. If you put all of the PCs in your group on a `minet`, you can send electronic mail to everyone very easily. However, you can also send

UNIX and UNIX-Like Operating Systems

NAME	Co-Mfr's	QNX	UNIX
MANUFACTURER ADDRESS TELEPHONE NUMBER	Whitesmiths, Inc. 97 Lowell Rd. Concord, MA 01742 (617) 369-8499	Quantum Software Systems, Inc. 6940 Santa Teresa Blvd. Lupa Plaza #6 San Jose, CA 95119 (408) 281-1586	Santa Cruz Operation, Inc. 500 Chestnut St. Santa Cruz, CA 95061 (408) 425-7222
PRICE NUMBER OF DISKETTES	\$695 5	\$1650 2	\$1350 19
TYPE OF SYSTEM Similarity to UNIX Multi-tasking? Multi-user?	UNIX-like Yes Yes	Influenced by UNIX Yes Yes	Enhanced version of UNIX Yes; has virtual consoles Yes
MINIMUM CONFIGURATION Number of drives Hard disk Partition size Amount of memory	2; root can run from floppy once it is prepared on a hard disk Required for installation 1.5 MB 128K	1 Not required 320K 128K	1 Required 268K (Operating system only) 256K
SUGGESTED CONFIGURATION Number of drives Hard disk Partition size Amount of memory	1 Speed much better with hard disk 2-10 MB 128K	1 Yes 700K 256K	1 Required 5.5 MB 512K
INSTALLATION Time required to install Ease of installation	30 minutes Easy	5 minutes Easy	1 hour Easy
DOCUMENTATION Number of manuals Clarity Completeness Ease of use Tutorials	8 Terse Good Needs global index for the 8 manuals Needed	2 Clear Good Very good Introductory	7 Good Good Not easy Introductory

PC DOS COMPATIBILITY Utility to transfer data to and from DOS? Extent of compatibility	Yes Uses DOS ROM for environmental interactions DOS can boot Co-Idris Has on-line escape to DOS to execute DOS commands	Yes Low; only works with DOS 1.0	Yes Can have both DOS and XENIX on hard disk
SHELL Characterization	Simplified Bourne shell	QNX shell; performs 10% of standard UNIX shell functions.	Bourne shell; Berkeley C shell
C COMPILER How closely does it adhere to Kernighan and Ritchie standard? Floating point support? Standard I/O library? Allows look at preprocessor output?	Closely Yes Yes Yes	Closely Only with 8087 chip Yes No	100% Yes Yes Yes
OTHER COMPILERS; LINKER Other compilers	Pascal - ISO standard	FORTRAN and BASIC are claimed, not reviewed.	No
UTILITIES List current tasks? List active users? Check disk for errors?	Yes Yes Yes	Yes Yes Yes	Yes Yes Checks for logical errors; checks for hard errors during formatting only
FILE MANAGEMENT Upload/download capability?	Yes	Yes	Yes
TEXT HANDLING Line Editor? Screen Editor?	Yes No	Yes Yes	Yes Yes
PERFORMANCE Speed Extent of bugs	Adequate Minimal	Excellent None	Slow Yes (prelease copy)

electronic mail coast-to-coast using uuop.

XENIX and PC-DOS

Because many people with PCs will not want to completely abandon PC-DOS, XENIX is supposed to have a facility that allows it to use only part of the hard disk, leaving the remainder for PC-DOS. This facility was not yet available for my review copy. The two systems won't be able to operate simultaneously even if both are installed on the hard disk, but XENIX will have a set of utilities for reading files on PC-DOS diskettes or on the PC-DOS section of the hard disk.

A utility that will bridge the gap between PC-DOS and XENIX will be Microsoft's long-awaited "visual shell," a command method for its operating systems that makes use of areas on the screen and cursor movements much as spreadsheets or windowing programs do. The visual shell, since it will be similar for the two systems, will make it easier for users to remember both. The visual shell was also not available for my review.

Technical Points

The *lingua franca* of UNIX is Bell Laboratories' C. As you would expect, XENIX comes with a complete implementation of C. It includes numerous libraries including *curses* and *termcap*, and the *lint* program for checking C programs.

The most important feature of XENIX C is support for the Intel middle memory model. You need the middle memory model only for a few very large programs—the small memory model is adequate for almost all of the programs supplied with XENIX. Having the middle memory model is important, however, because some of the most useful UNIX software is cramped by the small memory model. For example, in an older release of XENIX that only supported the small memory model, the *vi* editor was missing a number of important features. The current version of XENIX has a full-featured

On the whole, UNIX documentation is terse and strict, consisting of manuals that simply cite each UNIX command. XENIX documentation is in a similar style.

vi. Large applications programs such as data bases and statistics packages will benefit most from the inclusion of middle memory model C. (XENIX lacks the large memory model, which is used for truly enormous programs.)

The current XENIX version also includes the "C shell" or command interpreter, that was developed at Berkeley. Because of its advanced features, this shell can't be added to ordinary UNIX systems without modifying the internal structure of UNIX. The C shell is one of the most important UNIX utilities and it works well with XENIX.

One of the strengths of UNIX is its flexibility—its ability to be reconfigured for exotic applications. Can XENIX be adapted easily? Yes and no. The basic XENIX lacks the utilities for rebuilding the system. However, when I talked to SCO I discovered that a Link Kit would most likely be offered as a no-cost option for any users who needed it.

The Link Kit will allow you to add custom hardware such as graphics tablets, ethernet interfaces, and non-standard disk drives to your system. All of these peripherals require custom software additions to UNIX. With the Link Kit and the manufacturers' XENIX device driver, you can customize your system if you know what you're doing.

One technical problem with XENIX is its slow speed. I guess that speed will always be a problem when large systems such as XENIX are run on the PC. Boot-

ing the system takes about 2 minutes, and shutting down takes a similar amount of time. Starting most programs takes a second or two, but starting a large program like *vi* takes 5 or more seconds.

The PC has a slow processor and a very slow hard disk. Perhaps IBM's rumored new machine, "PC Senior," will be a better host for demanding software such as XENIX. The best programs written under PC-DOS are usually designed for speed, but this kind of design isn't as easy for XENIX-based programs because they have to be transportable to a vast array of different computers. XENIX's hesitation doesn't cripple the system, but it's an annoyance. Given the constraints of the PC hardware, Microsoft has done a reasonable job of designing XENIX to run as quickly as possible, but I think there is still room for improvement.

Documentation

An operating system approaches middle age as do most of us—its midsection becomes larger and less firm. UNIX's midsection is its documentation. The original UNIX documentation was an inch thick, while the complete set of XENIX documents is now about 5 inches thick—quite a reading assignment. On the whole, UNIX documentation is terse and strict, consisting of manuals that simply cite each UNIX command. Basically, the XENIX documentation is in a similar style, although a number of guides have been added that attempt to hold the user's hand

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for a short while by introducing some key ideas and attempting to provide some perspective.

The XENIX guides are helpful, but the real information is still in the reference manuals. If you want to use the setty command you have to look it up in the manual, period. Unfortunately, the manuals are almost duplicates of the Bell Labs originals. (Real programmers don't read guides.) I would have preferred to see Microsoft completely rework the reference manuals.

Missing and Presumed Lost

If you buy all three XENIX pieces, you get a very complete UNIX system with all of the original UNIX features, the best of the enhancements from Berkeley, new commands to work with MS-DOS files, and a new networking system. So what's the catch? What has Microsoft left out?

If you enjoyed UNIX's Chinese fortune

rather than look it up in a paper manual. For systems in flux, on-line manuals are almost a necessity because paper ones are always out of date. On-line manuals are less important in stable systems. It would be nice if Microsoft would offer on-line manuals as an option for users with enough disk space. Perhaps it could supply them on floppies so that they wouldn't gobble up the space on the hard disk.

Why UNIX?

Ultimately, the question is, why put a large system such as UNIX on a PC? For me, the answer is obvious: Although I admire the simplicity of PC-DOS, I often chafe at its limits. XENIX expands the range of the PC.

It has well-developed software for sending messages and programs from machine to machine, and powerful programming and text formatting features. It allows you to run several programs simul-

If you are using a PC basically as a typewriter, or if 1-2-3 is the only program you run, you should stick to PC-DOS. XENIX excels if you want to develop software.

Program, don't look for it in XENIX. None of the UNIX games have been included. The UNIX learn program, which teaches you UNIX by coaching you as you use the system, is also a casualty. However, critics of learn complained that there were too few topics of instruction available and that the system as a whole was bulky.

The most important omission in XENIX is on-line manuals. Like learn, the manuals were probably eliminated for lack of space. On-line manuals allow you to display a manual entry on your screen

taneously. People like me who use UNIX on larger systems prefer to use the same software on their PCs. If you are using a PC basically as a typewriter or if 1-2-3 is the only program you run, you should stick to PC-DOS. XENIX excels if you want to write a book, network with your coworkers, or develop software. XENIX-based programs are generally harder to use than PC-DOS-based programs, but they often go much further. And the skills that you develop on XENIX are directly transferable to UNIX-based systems anywhere.

A Classy Idris in the **UNIX** Neighborhood

Co-Idris is a multi-user UNIX lookalike with strong communications and multimachine software development capabilities, but it lacks many useful UNIX commands.



Idris, like the UNIX systems it is based upon, is more than just an operating system. Like MS-DOS, it manages machine resources and executes programs. The package includes compilers, communication links, and text handling capabilities. In addition, Idris is a multi-user system. Several users can share one machine, each working independently by interacting with an individual shell command processor.

UNIX-type systems such as Idris provide truly integrated environments. However, without special user-friendly front-

ends, they can be tricky for the novice to master, which restricts their primary audience to software developers and other experienced programmers.

Co-Idris

The 8086/8088 version of Idris is known as Co-Idris because it shares the machine with DOS and makes some use of its capabilities. (I will refer to the generic product as Idris, and to the 8086/8088 version as Co-Idris.)

Co-Idris comes on five diskettes. The first is a DOS diskette containing the boot-

able Idris; the others are Idris file systems full of programs. To install Co-Idris, you make a hard disk partition for it and boot the resident. You then use a series of shell scripts to copy the other diskettes onto the hard disk. Installation took me about 30 minutes.

In addition to the five disks, Co-Idris includes an imposing set of eight manuals of approximately 200 pages each, so finding particular pieces of information can take some searching. Some of the manuals have indexes, but a global index would have been very useful. (See sidebar, "Co-Idris Documentation" for a list of the Co-Idris manuals.)

I received a prerelease copy of Co-Idris, which I used for about a week before writing this review. I put it to work immediately on some big jobs. I have a collection of some 20 different C programs for timing the performance of C language. I have run these programs on PDP-11s, 68000s, and VAXes, but never before on an 8088-equipped machine.

It felt great to have a whole collection of UNIX-type capabilities on a little desktop computer. Within a fairly short time I had connected my micro to our office computer (also running Idris) via a serial port, transferred 1,000 lines of source code to the PC, run automated compiles and executes (using "shell scripts," UNIX jargon for batch files), printed out the results, and transferred the results back to the office computer. Using a modem on the serial line, I could have done the whole process across any distance that my phone budget would cover.

I had just one small problem with my prerelease copy: When I connected a terminal to one of the serial lines, the character erase, line erase, xon, and xoff operations sometimes hung up the system. Whitesmiths replicated the problem on their system, but P. J. Plauger, the president, said that the bug had been located and that it will be corrected by the time the product is officially released.

A unique feature of Co-Idris is its use of the DOS ROM. Idris goes through the

ROM to accomplish its environmental interactions. Thus, Co-Idris can be installed on a wider variety of 8086 and 8088 machines. The usual penalty for this "piggyback" approach is degraded performance. However, since I/O rates are typically limited by hardware anyway, the penalty may be negligible. Co-Idris' single-user performance feels comparable to that of a multi-user minicomputer.

Co-Idris takes up one partition on the hard disk; the other partitions remain available for DOS or other operating systems. The Idris software requires a minimum of about 1.5 megabytes (already more than 25 percent of a 305-cylinder disk), but the suggested partition size is 2.5 megabytes. The partition size and location are configurable. DOS can boot Co-Idris directly, and Idris can return directly to DOS. Like other UNIX-like systems for the PC, Co-Idris can read and write DOS files, but it also provides an on-line "quickie" escape back to DOS to execute DOS commands.

system while working independently of each other. Multi-user operation allows the use of passwords on log-in accounts, with separate working directories for different users. Serial lines can be quickly reconfigured into connections to printers, modems, or other CPUs, providing uplink/downlink file transfer and ASCII terminal emulation. I used all of these configurations without encountering any problems.

Resident Status

At the heart of any UNIX-like system is the resident, the part of the system that remains in main memory during operation. Some of the resident's capabilities are analogous to DOS functions. They provide environmental interaction for programs that supply text handling, sorting, formatting, spelling check, searching, printing, and other facilities. (For a more complete listing of Idris programs, see the sidebar "A Catalog of Co-Idris Software.") The resident also provides for

The C and Pascal compilers included with Co-Idris can produce programs executable under DOS, as well as under Idris and CP/M-86.

The C and Pascal compilers included with Co-Idris can produce programs executable under DOS, as well as under Idris and CP/M-86, by linking with different sets of libraries. Thus, Co-Idris could be a useful development environment for writing DOS (and even CP/M-86) applications.

Co-Idris comes configured with support for two serial lines. With two terminals attached, three people can share the

"scheduling" and "swapping" since it supports multiprogramming capability. This is what makes it possible for one user to execute several programs simultaneously and for several users to access the computer simultaneously if additional terminals have been attached.

The Co-Idris resident is fairly compact for a UNIX-type resident. It occupies from 40K to 50K RAM, depending on the configuration. Of interest to OEMs is that the

resident can be configured in ROM.

Software Development

Whitesmiths' strong suit is multi-machine software development. An organization developing products for several different CPUs will find Idris a very hospitable development system. As delivered, Co-Idris contains only 8086/8088 compiler support, but a variety of cross-support tools are available separately from Whitesmiths. Compilers, assemblers, a linker, a librarian, and other miscellaneous development tools are all portable and compatible.

Whitesmiths' C compiler is a solid, professional system that hews fairly closely to the line of standard C. (See "The Whitesmiths C Native Compiler," *PC*, Volume 3 Number 5, for an in-depth review.)

The Pascal compiler is strictly ISO standard with just a few extensions. Of course, Pascal programs from other environments are often so full of other vendors' extensions that they require massaging to fit into ISO standard form. The major extension provided by Co-Idris is the ability to link Pascal, C, and assembler files together, which means that anything inconvenient for Pascal can be accomplished at a lower level.

The linker provides exceptional support for cross-compilation, downloading, ROM configuration, setting memory origins for text and data, and specifying blocks of memory ("round up to boundary") origins.

This wealth of support also has a negative side: The sheer number of execution options can bewilder the beginner. The most common compile-and-link combinations have been provided in "prototype files," but the documentation of features and options is terse. More tutorials with examples are needed. According to Plaueger, tutorial examples will accompany the released version.

I tested the delivered C compiler and tools with a collection of source code from other systems. All performed perfectly. I

Co-Idris Documentation

Here are brief descriptions of the eight Co-Idris manuals.

- The *Idris Users' Manual* is the same for all versions of Idris.

- The *Idris Programmers' Manual* contains library calls and file formats.

- The *C Programmers' Manual* is identical for all machines running Whitesmiths' C.

- The *C Interface Manual for 8086* presents machine-specific information.

- The *Pascal Programmers' Manual*

is the same for all machines that run Whitesmiths' Pascal.

- *How to Use Idris: A Programmer's Introduction* is a tutorial textbook.

- The *ctext Manual* describes Whitesmiths' text formatter, which corresponds to UNIX's *nroff* and *troff* facilities.

- The *Installation Manual* explains how to get Co-Idris up and running.

did not have a collection of programs to test the Pascal compiler with, but since it is entirely portable I would be surprised if it differed from Whitesmiths' previous versions.

A Basic Benchmark

The following exercise illustrates some Idris usages as well as the timing of file-to-file I/O. To estimate the speed of copying files, I created a file of 100K and then timed how long Co-Idris took to copy the file. The percent sign (%) is the shell's default prompting character. Idris entered the percent signs and the real, user, and system times. I typed the remainder of the entries. Lines starting with a colon (:) are comments and are ignored by the shell.

```
% : create a file containing
10 bytes
% : (9 digits and a newline)
% echo 123456789 > 10bytes

% : make a shell variable, a
% set a 10bytes

% : catenate 10 copies of
```

```
10bytes
% : into a new file, 100bytes
% cat $a $a $a $a $a $a $a $a $a $a
$a $a >100bytes
```

```
% : repeat for 1K, 10K, 100K
. . .
% . . .
```

```
% : copy 100Kbytes into junk,
with timing
% time cp 100Kbytes junk
real 33.00
user 0.00
system 32.55
```

The real time is wall-clock time; user time is CPU time in the *cp* command; and system time is the CPU time it took to execute resident code.

The bottom-line result is that copying a 100K file takes about 33 seconds, or 3K per second.

Comparison With UNIX Systems

Idris is a UNIX lookalike that was independently programmed, not adapted from the AT&T Bell Labs source code. It has

much of the same functionality, but some additional advantages as well. Different implementations of UNIX often vary in small ways, so people who want an identical software environment on a variety of hardware configurations will probably find Idris superior. All the Idris implementations have the same system calls, commands, media capabilities, and physical file systems. And Idris can run on microprocessors with even less memory management than the 8086/8088 provides, such as a non-memory-managed 68000.

The current Idris resident has some nice features not found in UNIX. Command-line arguments are essentially unlimited in length—no more `arg list too long` messages. And the character-erase and line-erase in the terminal driver erase exactly the text that was entered, even allowing for tabs and prompt strings. Formatted data entry, with prompting messages, is clean and unsurprising. The Co-Idris resident provides quick transfer back

and forth with DOS and allows easy installation on any DOS-based 8086/8088 machine.

About half of Idris' user-level commands are identical in name and usage to those in UNIX systems. About a quarter have the same name but work slightly differently. (The Idris option syntax is, however, more predictable than that of UNIX systems.) Most of the remaining quarter are software development commands, which are more complicated than those in UNIX systems because of Idris' potential for cross-compiling.

The slight differences between Idris and UNIX are irrelevant to people first exposed to Idris, but they can be bothersome for experienced UNIX users. A "UNIX-compatibility mode" might be helpful for these users.

Some of the UNIX commands that are not implemented on Idris would have been very useful. UNIX fans will note the absence of the `lex`, `lint`, `make`, `sed`,

`uucp`, and `yacc` commands, as well as the absence of the Bourne shell. Rumor has it that AT&T may unbundle some of this software sometime soon. I strongly hope that Whitesmiths will provide the missing elements as add-ons if they become available. I especially miss the `make` command.

Memory Mapping

All the programs delivered with Idris run in the small memory model with the data segment and the code segment ("text segment" in UNIX jargon) sharing the same 64K space. Programs compiled for execution under Co-Idris will default to this configuration, but you can give them separate code and data segments by specifying "data bias zero" on the link step. In either scheme, all addresses are relative to the code and data segment registers.

This "almost-memory-managed" setup is convenient for the swapping behavior of UNIX-like systems. When more programs are active than main memory can contain, the operating system swaps a program to disk swap space. When the program is reloaded into main memory, it can occupy a different physical storage space. The resident sets the program's data and code segment registers appropriately, and the swap does not affect the program. Idris will run whether or not this swapping has been enabled.

Unfortunately for UNIX-like systems, the scheme does not provide complete memory-management protection. Almost all Idris (and UNIX) software is written in C, and C programs make heavy use of the stack. If too much data input causes the stack to grow too large, adjacent data or programs can get clobbered. There are two common solutions to this problem.

The first solution is a compiler option that generates dynamic stack-size checking at each function entry—and makes programs run about 5 percent slower. The second solution is to expand the program's data space so that a full 64K segment is used. This will provide the maximum stack capability and will also ensure that

A Catalog of Co-Idris Software

Here is a partial listing of the more than 100 programs included with Idris for the PC.

File and directory manipulation: `cat`, `chmod`, `cp`, `crypt`, `echo`, `ln`, `ls`, `mkdir`, `mv`, `od`, `rm`.

Housekeeping and status: `date`, `df`, `passwd`, `pwd`, `time`, `who`.

Text handling and formatting: `cmp`, `comm`, `detab`, `diff`, `e`, `entab`, `first`, `grep`, `head`, `last`, `lpr`, `mc`, `md`, `page`, `pr`, `roff`, `sort`, `spell`, `tr`, `uniq`, `wc`.

Program control: `error`, `hsh`, `kill`, `nice`, `nohup`, `ps`, `setb`, `sh`, `sleep`, `su`, `sync`, `tee`, `test`.

Communication and media: `cu`, `dn`, `export`, `import`, `mail`, `msg`, `pk`,

`recu`, `stty`, `throttle`, `up`, `write`.

Software development: `as.86`, `c`, `ccpm86`, `ccpm86f`, `cdos86`, `cdos86f`, `db`, `db86`, `hex`, `lib`, `link`, `lord`, `pl`, `p2.86`, `pc`, `pcpm86`, `pcpm86f`, `pdos86`, `pdos86f`, `pp`, `prof`, `ptc`, `rel`, `to86`.

System administration: `chown`, `dcheck`, `dump`, `fcheck`, `icheck`, `mkdev`, `mkfs`, `mount`, `ncheck`, `restor`.

System commands: `alarm`, `glob`, `init`, `log`, `multi`, `quit`.

About half of Idris' user-level commands are identical in name and usage to those in UNIX systems.

any overflow does not clobber other programs. Because of this security aspect, Whitesmiths has made this solution the default for user-compiled programs.

Some support is also provided for the middle and large memory models in which code and data segments can exceed 64K. Functions callable from C are provided for manipulating code, data, and extra segment registers; for far calls; and for moving data. However, programs using the middle and large memory models will not work in a swapping environment because their physical locations could change underfoot. Whitesmiths has plans to incorporate its nonmanaged scheduler into Co-Idris (which would ensure that middle and large memory model programs always swap back into identical physical locations), but not in the first release.

Idris has possibilities for systems even smaller than the PC-XT. According to Plauger, with just a few hundred kilobytes of RAM (and possibly ROM), fast Idris systems with only two diskettes or bubble memories are technically feasible. The root file system could even be rooted in a combination of ROM and RAM. I used one of the earliest diskette-only Idrises in 1979 on a 64K PDP 11/03 system. It worked, but was it ever slow!

In the last 5 years, hardware better-suited for small UNIX-like systems has been developed. The next step is a lap-size UNIX-type system, and Idris might well be the first.

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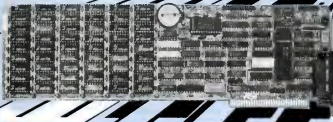
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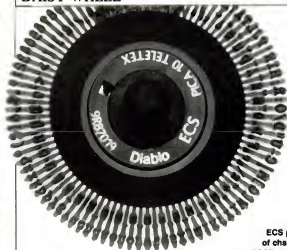
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DAISY WHEEL



Print wheel
for the Diablo 630
ECS printer has two rings
of characters, the outer for
the ASCII extended character set.

for. This printer has it all—speed, graphics, and charm. But its best feature is its ability to print the ASCII extended character set (ECS).

The ECS Difference

Looking at the 630 ECS' daisy print wheel will give you the first indication that this printer is different. Each of the daisy's "petals" bears two characters that form an inner ring and an outer ring on the print wheel. The inner ring bears predominantly the lower 128 characters of the ASCII character set, such as the ones on the keyboard. The outer ring bears the upper 128 characters of the extended ASCII set, such as the ones shown on pages G-4 and G-5 of IBM's BASIC manual. This upper set includes mathematical symbols, graphics characters, and many foreign characters. The print wheel bears only 192 characters. Some of these characters are components used to form the remaining characters in the ASCII set. The printer's logic con-

structs these extra characters through multiple character strokes. In addition to this special wheel, the 630 ECS can use all Diablo and Xerox 88-, 92-, and 96-character print wheels.

In the past, the extra ASCII characters could be displayed on the IBM PC screen, but they have not been available on most

Looking at the 630
ECS' print wheel will
give you an
indication that this
printer is different.

printers. Since the first 128 characters are the only ones that are standard throughout most of the computer industry, some printers do not recognize ASCII codes other than these. And since the upper 128 ASCII characters have not been standardized, the codes can signify any character the computer manufacturer wishes. The 630 ECS recognizes the entire IBM ASCII set and is able to print it directly. Pressing the PrtSc (print screen) key will result in a printout exactly duplicating the screen, including any graphics you have generated with the extended character set. These characters

can be included in text documents for printing. You do not need to enter special print codes.

Diablo designed the 630 ECS to be directly compatible with the IBM PC. It comes with an all-purpose parallel interface and cable. The printer is preconfigured for the IBM, much as is the NEC 3550. Included with the printer is *Word-Plus-PC* by Professional Software, a nicely designed word processing package that allows you to include the extended character set in your document using the Alt key and the numeric keypad. You cannot do this using *WordStar* or many other word processing packages.

The 630 ECS is rated at 40 characters per second using standard metalized print wheels. When using the ECS plastic print wheel, its speed drops to 32 cps in non-shifting mode.

It will detect when the ribbon or paper runs out or if the cover is open; it includes self-testing, diagnostics, bidirectional line feeding, graphics, and HyPlot vector plotting features as standard. The printer also features proportional spacing, justification, underscoring, and bold or shadow printing. The 630 ECS' print line is 13.2 inches with 132 columns in 10-pitch, 158 columns in 12-pitch, and 197 columns in 15-pitch format.

The front panel switches include controls for line feed, form feed, pause, and break, which clears the print buffer. Under the front cover are controls for selecting printer pitch, metal or plastic print wheels, and foreign language sets.

Using the Printer

Using the printer and accessing the special characters is no problem. The *Word-Plus* package allows you to enter special characters directly into a document by holding down the Alt key while typing the ASCII code for each character on the numeric keypad. The character appears on the screen as it will look when printed. No further modification or coding is needed.

I tried creating the special ASCII char-

Diablo 630 PC ECS Printer

Diablo Systems, Inc.
901 Page Ave.
Fremont, CA 94538
(415) 498-7000
List Price: \$2,995

CIRCLE 687 ON READER SERVICE CARD

acters with various software packages and found some that worked and some that didn't. BASIC, of course, will handle these special characters. *MultiMate*, *Volkswriter*, and IBM's *Personal Editor*

will all generate the extended codes on screen. *Spellbinder*, *WordStar* and *dBASE II* will not.

To illustrate the 630 ECS' capabilities, I have created some charts and special character displays using *WordPlus-PC*. They could be re-created using any software or programming language that can produce the entire ASCII extended character set.

The quality of the 630 ECS' printouts is high, with one minor exception: Some lines created with multiple character strikes do not quite line up vertically. Figure 1 shows an illustration done with the ASCII graphics characters. It took less than 20 seconds to print.

Figure 2 demonstrates the printer's mathematical symbols. When producing a multiple-line display like this illustration, you must change your vertical line spacing so that the symbols will connect. All illustrations are printed out exactly as they appeared on the screen. Figure 3 illustrates the 630 ECS' foreign characters. Most of them are formed by printer logic, striking two characters in the same place. ■

Tom Sheldon is a systems analyst and technical consultant for ComputerLand of Santa Barbara and ComputerLand of San Luis Obispo.

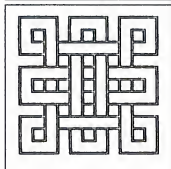


Figure 1: A complex maze printed by the Diablo 630 PC ECS in 20 seconds.

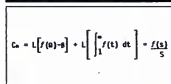


Figure 2: Mathematical symbols from the ASCII extended character set produced on the Diablo 630 PC ECS.

ü é à ä å ç è ë ò ö ô û ý á ñ

Here are a few examples of foreign language text:

French: Avec ces caractères spéciaux vous pouvez imprimer précisément ce que vous avez écrit en français.

German: Mit diese Charakteres können Sie ausdrücken was Sie auf deutsch sagen wollen.

Spanish: El programa soporta tipos especiales e inclusive la tilde, la "ñ" y los signos de interrogación "¿" y "?". Con estos tipos se puede imprimir lo que desea en español.

Figure 3: The Diablo 630 PC ECS' foreign language symbols.

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APPLICATIONS/STEPHANIE STALLINGS

The MLA Learns a New



The Modern Language Association (MLA) is showing humanities scholars that the PC can mean more time spent thinking and less time spent on drudgery.

Language

The newest language spoken at the Modern Language Association (MLA) these days is likely to be a computer language. For almost 100 years, the MLA has been a leader in humanities scholarship, a discipline often considered hostile to computers. But now the MLA is showing scholars that, in both administration and research, computers can contribute to work in the liberal arts as well as to more quantitative projects.

The association became acquainted with computers in the mid-1960s, when a mainframe was installed to help with administrative functions at the MLA offices in New York City.



The association soon began using data processing to prepare the *MLA International Bibliography of Books and Articles on the Modern Languages*, a standard in the field. When the personal computer was introduced to the market, the MLA's deputy executive director, Hans Rutimann, saw new possibilities for applying the microcomputer's capabilities, and at his urging, the association began to expand its investment. The MLA now owns five IBM PCs and plans to purchase several more.

Perhaps the biggest contribution computers are making to the work of the MLA is in the accessing of on-line databases. Elaine Silver, assistant to the deputy executive director, for example, can plug in a modem, sit down at her PC, dial into the Dialog network in California, input her account number, and access the *MLA International Bibliography*. Once there, she can request listings of, say, all the journal articles published since 1970 by or about Isaac Asimov. In moments, the names of these articles will start to appear on the screen and printout: "Philosophers Look at Science Fiction," "Science Fiction as Truncated Epic," "How Machines Become Human."

"We plan to offer an offshoot of this search service to our members," Silver says. "They'll be able to request very complex searches. We'll have a staff member set up the search commands, load the extracted information onto a disk, and send it back to the scholar. They can look at it on their PCs and keep the disk for reference."

Spreading the Word

Familiarizing the MLA staff with the new technology has been a gradual process. Rutimann explains during a tour of the association's offices. In an attempt to minimize the anxiety that often accompanies the introduction of computers into an office setting, PCs have been placed on desks of selected staff members, who, Rutimann hopes, will help "formulate policies on the whole range (of) software,

maintenance," and procedural needs.

One of these staffers is Walter Achtert, director of book publications and research programs. With infectious enthusiasm, he describes how he uses a spreadsheet to input and analyze book sales data, first



Computers provide scholars with a new serendipity factor by affording them more time.

collected on and printed by a mainframe computer, on the PC. "What I'd like now is to have the raw data sent directly from the mainframe to my PC so that we wouldn't have to input it again," he says.

"One of our goals is to reduce the backlog of programming requests for mainframe services by moving procedures that are now inappropriate for mainframes to the PCs," Rutimann adds. "These would be activities that don't require customized programming, or that don't have the large file size and complexity to necessitate using the mainframe. We are reducing the backlog, but at the same time, having the PCs here helps people think of new things they would like to do on both the PCs and the mainframes."

The MLA encourages authors to send

manuscripts to them on disk so that any further editing can be done without having to retype the manuscript. Achtert also uses the PC to prepare the manuscript of the *MLA Handbook*, a well-known manual of style. The *Handbook* requires numerous print fonts, tab settings, and formats to distinguish the different elements of the text. But how can the writers indicate these composition codes? And will the writers be restricted to one word processor in order to use the codes, even though they may already own or prefer another one?

Achtert uses the PC to add the needed flexibility to the process. "I've created generic codes to describe all the possible composition directions. For instance, @cn@ indicates that the succeeding number is a chapter number, and so should be printed in a certain size and weight. The code @@ indicates that what follows is to be in italics. Extracted text can be identified with @pext@, which will indent the first line.

"We enter these codes and the text with *Multimate*, though it could be done with any word processor. After entering the text and codes, we like to get some idea of how the manuscript will look in finished form, so I've created a conversion table that translates the generic codes into *Multimate*'s internal codes." A similar conversion table and program could be designed for any word processor.

Achtert has also taken advantage of *Multimate*'s macro facility to create one- and two-key commands that call up the generic code strings. This saves many keystrokes when a string of generic codes has to be entered.

Typesetting, Too

A third part of Achtert's conversion table translates the generic composition codes into the codes used by the MLA's Compugraphic MCS 8400 typesetting system. This is a snazzy combination of hardware and software that takes care of the entire typesetting operation, from entering text to photographically creating the galley proof that is sent to the printer.

The text, complete with Compugraphic's own composition codes, is entered at one terminal and monitor. The text's final form is displayed on a second screen. Another machine, the size of a large copier, photographs an exact duplicate of the image on the second screen, which is then sent to the printer. "This system works very well, but it would be even more efficient if we could connect it directly to our other computers," says Silver. The IBM PC will be the vital connection.

"What's more natural than to establish a link between the Compugraphic and the mainframe, extrapolate the directories and bibliographies, and send them over and typeset them?" asks Rutimann. But to do this, "you need an incredible modern configuration," he points out. An alternative is to use the PC as the link and "go from mainframe to PC and then from PC to typesetter." Connecting the PC to the typesetting machine also opens up the possibility of using Achtert's conversion table. Thus an editor might receive and edit a manuscript, convert the generic codes to the Compugraphic's composition codes, and then send it to the typesetting machine. The manuscript would be typeset, reviewed again, and photographed. It would not appear on paper until that point.

PCs Go to School

In addition to helping the MLA produce the printed word, the PC is also being promoted as a tool for teachers of the humanities. Like Achtert, Phyllis Franklin, director of English programs, has a PC in her office. Guided by an extensive teaching background, she is helping to coordinate an MLA foray into the area of computer-aided instruction (CAI). Many teachers, she points out, are confused about the kinds of courseware available, how it should be used, and how the introduction of the computer to the classroom will alter their roles as instructors.

To assist them, the MLA has begun evaluating and reporting on CAI packages. The second book of its Technology

and the Humanities series, is devoted to CAI. "Our members, as an expert group, have some purchasing power, or say so, in telling the developers of educational packages what they don't like, and by extension, what they really ought to have,"



Academics who are not knowledgeable about technology will forfeit their influence.

Rutimann explains. The MLA, he says, aims to educate its members in the area of CAI so that they in turn can inform the manufacturers of special needs.

Changing Conventions

The MLA is attempting to expose other academics to the ways in which computers can make their research and teaching easier and more rewarding. This goal was evident at the MLA's annual convention held at the New York Hilton last December. An unsuspecting visitor expecting in-depth discussions of early Renaissance poetry would have found some surprises among the offerings at this convention. In addition to seminars on traditional subjects, there were others with the unusual titles, "Data Bases for Literary Study," "Lexicography and Microprocessing,"

and "Word Processors and the Teaching of Composition." The entire Rhineland Gallery of the New York Hilton was set aside as an electronic workshop where members could demonstrate home-made software. Among the demonstrations was a program to create bibliographical entries and another to drill students in Latin verbs. In addition, the Sheraton Hotel Exhibition Center housed a technological exhibition where manufacturers unveiled packages to improve reading and composition skills.

While exposing academics to the benefits of the computer, the convention also conveyed the needs of the academic community to the manufacturers of hardware and software. "If professional organizations and their members are not knowledgeable about new technological services, they will forfeit their decision-making influence to commercial enterprises," says Rutimann. "We really have become information brokers."

The MLA further expresses its commitment to this role through the MLA Consortium for Computer Services. For a fee, it supplies associations with a full range of data processing services, from account management to file maintenance.

Getting Results

The MLA's efforts to computerize its organization and to communicate its message about computers to the rest of the academic community has begun to produce results. Elaine Silver points out that as the International Bibliography and the MLA's other guides are computerized, extracting information from them becomes easier. Also, attitudes toward the computer are changing within the academic world. The trick has been to persuade humanities scholars to relinquish their allegiance to manual research methods. The advent of microcomputers and easy-to-use spreadsheets, databases, and especially word processors, have begun to change people's minds.

"The same people we've been preaching to for 10 years are discovering, to their amazement, that for the past 10 years

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we've been creating this wonderful database in their discipline, and they are now starting to make demands for a larger database," Rutimann says. Once they accept the idea of using an electronic bibliography, scholars discover that they can zero in on their topics merely by typing in the proper commands, thereby cutting down on time-consuming library searches.

One positive aspect of library research that many scholars fear microcomputers threaten, however, is the "serendipity factor"—the chance discovery of hidden, printed riches while browsing through the card catalog or library shelves. But, Rutimann suggests, the computer provides scholars with a new serendipity factor by affording them more time to "pursue interesting lines of inquiry." And, as databases are slowly extended back in time, it is becoming unnecessary to search through bibliographies in book form at all, saving even more time.

New Horizons

Rutimann states that, "Ideally, what we're doing here with computers frees people from drudgery and allows them to use their valuable time more effectively." In addition to assisting scholars gather information, by speeding up processes such as textual analysis, computers can help researchers use the information they acquire. In its most basic form, textual analysis consists of counting and comparing word occurrences. Programs for accomplishing this are now becoming available for personal computers. "We're working with an author who's editing the papers of an early president of the United States," says Rutimann. "He's been using database searches, word processing, and textual analysis in his study. He told me that if he were doing this work 20 years ago, he could have spent his entire career without ever completing the project. But now, thanks to computerized writing and research tools, he will be able to finish the papers, see them in print, and go on to another project. Computers have saved him a lifetime."

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PCs and Social Scientists The Chemistry Is Right

Political scientists, historians, and sociologists are putting PCs to work, despite several stumbling blocks.

Wherever you find social scientists these days, you'll hear talk about personal computers. Thousands of sociologists, political scientists, and historians already use microcomputers for scholarly writing and research, and many more are thinking about it. Personal computers are also showing up in the classroom as universities undertake major purchasing programs. Manufacturers introduce new products aimed at the academic market

almost weekly, while social scientists themselves are turning out software for an expanding range of applications.

It seems like a natural fit. Social scientists write, manipulate numbers, access and maintain data files, and sometimes construct sophisticated mathematical models. Certain subdisciplines—survey sociology and quantitative history, for example—have long used mainframe computers.

The move into the micro world, how-





ever, has not been smooth. Some social scientists who have little prior experience with computers have been intimidated and confused, while more experienced computer users have been reluctant to give up the mini and mainframe environments they are used to. Others have been discouraged by the lack of suitable software. There are compatibility problems, too, as dozens of hardware manufacturers compete for the university market. Social science micro use will clearly grow rapidly in the coming years, but it is less clear how social scientists will ultimately use their personal computers and how their fields will be changed as a result.

At the moment, the picture varies greatly from school to school and discipline to discipline. At one extreme are a handful of universities, including Brown, MIT, Drexel, and Carnegie-Mellon, that are committed to providing virtually everyone on campus with a computer. The most advanced plans include sophisticated networks, now being developed by IBM and other companies, that will link thousands of micros and terminals with one another and to central mainframes. At the other extreme are colleges where at most a few faculty members have purchased personal computers with their own money and without institutional support.

One school that falls in between is New York City's Queens College. IBM gave the school's education department 15 PCs. The department's computer center has about the same number of Apples. The sociology department has bought a PC, an XT, and a letter quality printer and is in the process of doubling that inventory. According to its chairman, Lauren Seiler, about a third of the department's 29 full-time faculty members have personal computers at home. The department has encouraged faculty members to purchase IBM or IBM-compatible equipment so that they can exchange disks.

Columbia University's Center for Computing Activity handled volume purchase requests for several hundred IBM PCs and a smaller number of other micros

Universities
such as
MIT and Carnegie-
Mellon are
committed to
providing virtually
everyone on
campus with a
computer.

last year. Next year the Center anticipates 1,000 micro purchases.

Dr. G. David Garson, political scientist and editor of *Social Science Micro Review*, predicts that "within the next 5 years, about every social science department will have a microcomputer lab. Now, about 25 percent do." What are all these personal computers being used for? The most popular application by far is word processing. The printed word, after all, is the lifeblood of academia. At one time many schools had secretarial staffs to type repeated drafts of faculty articles and books. These days only the richest schools can afford such luxury, and microcomputers are filling the gap. Many social scientists have purchased PCs with this in mind. Graduate students, who have always had a hard time affording typists, also have been quick to embrace word processing.

Academic writing has its own conventions, particularly the heavy use of footnotes. Until recently, very few word processors were designed to handle this. Software developers, however, are finally catching on, and a number of programs designed to deal with footnotes are now available.

Beyond Word Processing

Many social scientists are also using PCs to store notes, grades, and records.

Some use simple, commercial data management systems. Others prefer programs aimed particularly at the academic market, such as Pro/Term Software's *Bibliography*, which keeps track of citations. There are several programs out for recording student grades. Universities are developing custom software as well; the Center for Social Science at Columbia, for example, is hoping to make available a program for annotating text that will present a document in one window and room to write notes in another.

Word processing is often just a first step. Take Michael Finefrock, a Middle Eastern historian at the College of Charleston in South Carolina. He first got involved with computers when he purchased a small Radio Shack machine to speed up his writing. After two more Radio Shacks, he decided that IBM compatibility was crucial so he purchased an Eagle PC and a 20-megabyte hard disk. He had a problem, however: Some of his writing was in Turkish, which uses diacritical marks. At the time, no commercial software was available to generate the characters he needed. Before he knew it, he was learning assembly language to modify his word processor to produce Turkish text on his daisy wheel printer. In the process, he got hooked on programming.

Ever since, Finefrock has been developing software for the many tasks that make up a typical college professor's daily life. To help with his own research, he wrote a program in BASIC with Tom Baskett, a former superintendent of the U.S. Naval Observatory, that converts dates from one past calendar to another, say from the Georgian to the Coptic, or from the Julian to the Muslim Hijra. (If you have ever worked with really old documents, you know what a pain in the neck this can be.) Now Finefrock and Baskett are modifying a medieval simulation game, "Graymoon," for use in a European History survey course.

For student advising, Finefrock uses *VisiCalc*; students can immediately see

the consequences of grades and course selections on their grade point average, academic standing, and progress toward graduation. He also uses *VisiCalc* to keep track of his reimbursable expenses—in fact, his college's financial office has adopted his template. Drawing upon these experiences, Finefrock recently wrote a three-part series on "Computers and the Historian" for the American Historical Association's newsletter, *AHA Perspectives*.

Finefrock is an exception. According to Charles Wetherell, director of the Laboratory for Historical Research at the University of California at Riverside, "In general, the historic profession is not computer literate." Most historians have neither used a computer nor thought about the impact of computers on society. Wetherell estimates that only 10 to 20 percent of them have decided that computers are worthwhile. Most historians who do own personal computers use them only for word processing.

Wetherell sees the reason as two-fold. First, historians tend to associate computers with quantitative work, a relatively small subdiscipline. Second, most of the three or four thousand historians who do conduct quantitative studies are themselves not very sophisticated in the use of computers. Many of the best-known quantitative historians utilize the services of large university computer centers and have assistants to do most of the programming. As a result, they have been slow to switch to personal computers. Of the half-dozen major quantitative studies now underway at U. Cal. Riverside, only one, a study of the gross national product during the nineteenth century, is being done on a micro.

Socio-Political PCs

Other disciplines have been more open to change. Since World War II, American sociology and political science have been heavily quantitative; in these fields, the problem is not getting accustomed to computers but finding the right software.

Thousands of sociologists, for instance, routinely collect and analyze large amounts of statistical data. Usually they work on minis or mainframes with one of two powerful programs, *Statistical Package for the Social Sciences (SPSS)* and *Statistical Analysis System (SAS)*. In an effort to capture this market, manufacturers have released a flood of statistical programs for micros. (See, for example, "Adding It Up With StatPac," *PC*, Volume 3 Number 1.) Most, however, cannot handle the massive data files that social scientists sometimes work with. In addition, most of the currently available programs lack certain routines available on mainframes and tend to be slow. Although many of the programs are modeled on *SPSS*, they inevitably involve learning at least some new commands and procedures.

These limitations may soon be largely overcome, because a PC version of *SPSS*

Most historians have neither used a computer nor thought about the impact of computers on society.

is about to be released. It will require a double-sided disk drive, a hard disk, 320K RAM, and an 8087 math coprocessor (a chip that fits on the IBM system board). Although it won't be cheap, *SPSS/PC* looks very good on paper. Mainframe *SPSS* users will already know most of the commands and will be able to download their existing files for PC processing or upload *SPSS/PC* files to mainframes and minis. Although *SPSS/PC* will not have all the features of its big brother, it will be interactive and include the most widely-used statistical procedures. Almost every quantitative social scientist I spoke to is eager to see *SPSS/PC* in action. If it deliv-

ers all that is promised, it may be for social scientists what *VisiCalc* was for businessmen—the program that convinces skeptics to dash out and get a PC.

Other mainframe programs are also being scaled down for the PC. Addison-Wesley, for example, promises to release an IBM PC version of *Micro-Dynamo* any day now. (An Apple version has been available for some time.) *Micro-Dynamo* is a modification, written in Pascal, of the popular *Dynamo* mainframe simulation program. Over the years, *Dynamo* has been used by demographers, sociologists, epidemiologists, and other social scientists to create complex models of, for example, population growth or the impact of heroin use on crime rates.

In general, software designed specifically for social scientists has been slow in coming. One reason is the highly specialized nature of their work. As a result, the market for a particular application is often too small to justify commercial development. Much social science software will have to be written on campuses.

A Survey of Surveys

Some of the most interesting software already being designed at universities is revolutionizing the collection of survey data. In the past, most surveys were conducted door to door. Nowadays the telephone is more common; it is cheaper, and people are reluctant to let strangers into their homes. With this change has come computer-assisted telephone interviewing (CATI). In CATI systems, a telephone interviewer sits in front of a personal computer or a terminal that displays questions and records answers. Responses no longer have to be transferred from paper to machine-readable form. CATI systems can be programmed to randomly vary the order of questions from interview to interview, eliminating a possible source of bias. Depending on the answers given to selected questions, complex branching patterns can provide different sets of additional questions. In effect, instantaneous customization is possible.

Self-administered questionnaires can do the same thing—and save some phone calls. (An article on electronic questionnaire design, "Developing an Electronic Survey," appears in this issue.) Mel Richler, a sociologist at Queens College, is conducting a study of friendship patterns using an IBM PC and a program he has written in Pascal. At their convenience, his subjects come to an office, sit down at a PC, and respond to a series of questions. Richler is modifying his program to categorize respondents on the basis of their answers to an initial set of questions and then ask appropriate additional questions. For example, males who report that they have few friends will be given one set of questions; those with many friends will receive another. The categories themselves will be program-generated based on patterns that emerge in previous interviews.

While most micro social science applications simply offer a new way of doing an old thing, computerized interviewing is a genuine innovation. Although in theory traditional survey interviewers could be trained to vary questions based on earlier responses, if the branching pattern is at all complex the procedure quickly becomes too unwieldy to be practical. Using small computers, social scientists can now routinely pursue many different lines of questioning, all in the same survey.

Undergraduates in social science classes are making use of PCs as well. This term, for instance, Professor Ada Finifter introduced a course at Michigan State University on microcomputing and political science. Her goal is to illustrate how micros can be used for research and how they are changing politics. Her students get plenty of hands-on experience in a lab equipped with ten IBM-compatible Columbia PCs. One required project is the analysis of data from the 1980 Presidential election. Finifter had a cross-tabulation program written in APL for this purpose after she tried a few commercial programs and found them too slow for classroom use. The students get practical experience

in computerized budgeting and project planning, and they even try some military strategy games. Their papers are written in the lab using a word processor.

According to Finifter, political scientists have generally been enthusiastic about micros. Her department is slowly providing every faculty member with an IBM PC. She herself has a Columbia which she uses for her research in political behavior and emigration. Since her data

Columbia University has the entire 1980 Census on-line, an extraordinary resource.

files are large, she keeps them on tape at her school's computer center and accesses them through a modem and a terminal emulation program. When she uses SPSS, she has the often-voluminous output directed to her Columbia for storage or printing.

Professional Recognition

As the personal computer becomes a more and more common sight on the social scientist's desk, professional organizations have begun to take note. Last summer, an entire issue of *News for Teachers of Political Science*, a publication of the American Political Science Association (APSA), was devoted to microcomputing. The Organization of American Historians recently ran a series of articles about computers in its newsletter and is now conducting a survey of its members to see what software they are using. Recent conventions of the APSA and the Eastern Sociological Association have featured hardware and software demonstrations, and convention panels on microcomputer applications have become common.

Specialized journals are springing up as well. *Social Science Micro Review*, a

quarterly, is put out by North Carolina State University. Each issue is divided into four sections; one has articles of general interest, while the others focus on IBM, Apple, and CP/M machines. In addition, the *Review* issues a series of program disks, currently only for Apple micros, but starting next year for IBM PCs as well. *Collegiate Microcomputer*, put out by the Rose-Hulman Institute of Technology in Terre Haute, Indiana, is not specifically aimed at social scientists but includes many relevant articles.

Large university computer centers are also redefining their function in the light of personal computing. The Columbia University Center for Computing Activity started as a large mainframe facility, according to Frank Da Cruz, manager of system integration. Its most important purpose was to provide central processing time for batch runs and later for time sharing. With the proliferation of personal computers, however, "the trend is moving away from using the central system for CPU cycles or text editing," Da Cruz says. The Center is now concentrating on providing services that are cost-effective on a centralized basis: communications, mass storage, and printing.

Right now, for example, a PC user with a modem can do high-speed sophisticated printing on the Center's Xerox 9700 laser printer. If nothing else, this may put that time-honored professional, the dissertation typist, out of business. For little more than what it costs to have a long dissertation typed, a graduate student can buy a PC, use it to write and edit a thesis, and have copies centrally printed to meet the exacting standards most schools set for dissertations.

Very large databases stored at central university facilities can be accessed through PCs. Columbia University, for instance, has the entire 1980 Census on-line, an extraordinary resource. To use it, a PC owner needs only a terminal emulation program (which the computer center provides) and a modem. A sophisticated search system finds the part of the Census

you are interested in, which you can then download to your own machine using KERMIT, an error-free file transfer program. At that point you can hang up your phone, analyze the data with a program such as I-2-3, store the results, print them, or even send them off via modem to a colleague.

Most of the centralized databases now being used by social scientists are bibliographic. They are great for finding references, but they do not tell you much about what those references say. However, some actual text collections are becoming available.

To aid a team creating a new dictionary, a French government institute arranged to put 1,500 French-language texts from the seventeenth through twentieth centuries into machine-readable form. Since January, this mass of information has been available through the ARTFL Project at the University of Chicago, and it can be accessed via a personal computer, a modem, and either a regular telephone line or Telenet. Very intricate searches are possible—for example, for portions of text containing specific words or containing given words in proximity. Users can make hard copies of the text they are interested in, but under an agreement with the French government, they cannot make electronic duplicates. Although ARTFL originally anticipated that the system would most interest lexicographers, so far the heaviest users have turned out to be historians.

PC use in the social sciences is still in its infancy and the possibilities seem unlimited. More and easier-to-use software will soon be available and as younger professionals who are more attuned to personal computers than their senior colleagues filter into the disciplines, new applications will be tried. While the road may remain rocky, it is hard to imagine going back. ■

Joshua Freeman is a New York City-based historian who does dBASE II programming on the side.

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PCB

HARDWARE/WILLIAM K. HOWARD

Off beat Solutions to Common Problems





The PC marketplace is full of unusual accessories, some gimmicky and some truly useful. Here are some of the best and how they can benefit you and your computer.

Hundreds of PC accessories compete for your pocketbook. Some work; others will only make you poorer and wiser.

The best of the marketplace's unusual accessories or products can make living with your PC more enjoyable and productive. These products are:

- Unusual yet functional. That is, they include no foam rubber "Byte Bats" for taking out your frustrations.
 - Relatively new to the market, comparatively little-known, or exclusive to one or two manufacturers. This leaves out all the oak computer desks, gender-changer cables, and power-surge protectors. All of these are good products, but there are dozens on the market that you probably know about already.
 - A good deal for the money although not necessarily cheap.
 - Real solutions to real problems.
- Let's take a look at a dozen problems and their solutions.

Some Disk Disasters

Floppy disks are the bane of some PC users' lives. For instance, you know you're supposed to put your diskettes in their envelopes and back in the storage box the minute they come out of

The Rolltop Disk File (left) and the Disk Jockey, both from MicroComputer Accessories. Each solves a common disk storage problem.

OFFBEAT SOLUTIONS

the drives, but you tend to forget and leave them on the desk. Last week you knocked over a cup of coffee, and the results were disastrous. The week before, you came back from lunch to find a stapler that had somehow become magnetized sitting on top of the 1-2-3 data diskette you'd been meaning to back up.

One solution to a problem like this is a diskette stand that holds 5 or 10 diskettes upright for easy viewing and out of harm's way. Only a direct overhead spill is a hazard.

Diskstand from Damomics (\$8.95) takes up 8½ x 11 inches and holds ten diskettes upright. The Disk Jockey from MicroComputer Accessories (\$6) stacks five diskettes circular-staircase fashion, has a hole for pencils and a slot for labels or a sixth diskette, and takes up only 5½ x 7 inches of precious desk space. Once you've seen these inexpensive diskette holders, you'll realize that the concept behind them is simple. Had you thought of the idea 5 years ago, you'd be on your way to the Fortune 500 now.

However, these handy gadgets hold only a few diskettes at a time, and I have nearly a hundred. The ubiquitous flip-top smoked-acrylic diskette cases take up a lot of room for the 50 diskettes they hold. The obvious solution is a hard disk, but if you're addicted to floppies or to saving money, try the Rolltop 100 from Microcomputer Accessories (\$36), a disk file that can hold 100 disks. The Rolltop is nearly twice as long as a common 50-disk file such as the popular Flip-N-File, but when you include the rear clearance a flip-top file needs to make room for the top to tilt back, the Rolltop measures only about 2 inches longer.

Disk trays with removable tops hold just as many disks as the Rolltop but since the Rolltop's top is self-contained like a rolltop desk, you're more likely to put the

top back after removing a diskette, making the ones inside that much safer.

If the standard model's ivory and brown color scheme isn't "you," an executive model Rolltop in black and silver is available (\$39.95). Locking models in either color combination costs \$10 more.

Once your diskettes are under control and you can see the surface of your desk again, you may notice, as I did, that the height of your desk makes the PC's keyboard difficult to use. Standard desk height is 29 to 30 inches, while typing surfaces should be lower than that—26 to 27 inches high. Most people don't have enough room for a separate computer desk that puts the keyboard at a comfortable height.

You can remedy this awkward problem by purchasing a keyboard platform that extends over the edge of a desk and lowers the keyboard about 3 inches. The Ergo-Mate by Mead-Hatcher (\$115) provides both a keyboard platform and a copyholder between the keyboard and PC. The weight of the PC system unit and monitor keeps the keyboard from falling off the desk.

Simpler units consist of a piece of bent and painted steel or aluminum, such as the Easy Angle made by Global Computer Supplies (\$34.95). You can buy one off the shelf, or go to a competent metal shop and ask them to bend one from a piece of scrap metal at least 24 inches long.

A third option, the Under Carriage Keyboard Drawer (MicroComputer Accessories, \$54), does just what the name says. It screws in place under the desk or table, pulls out for use, lowers the keyboard about 3 inches, and retracts when not in use.

It's no secret that the keyboard itself has some, shall we say, small imperfections. For one thing, the Enter, Ctrl, and Shift keys are too small. Key caps or key collars can increase the striking surface of some of the special keys.

Keyfixer from Vertex Systems (\$14.95) is a set of five collars that fit



Left to right: Ledu's IPL600 fluorescent lamp, Luxo's fluorescent CODE 1 lamp, and the Asymmetric lamp, also from Ledu. All three cut down monitor glare.



OFFBEAT SOLUTIONS

Top: Touchdown Keytops, Hooleon Co.;
center: the CRT Shuttle, Global
Computer Supplies (left) and the
Monitor Mover, Lintek; bottom: the
PCool fan, Analytic Information
Processing.



around the two Shift keys, Enter, Tab, and a fifth key of your choice such as Backspace or Ctrl. Touchdown Keytops from Hkoleon Company (\$18.95) is a set of 12 caps for the two Shift keys, Tab, Ctrl, Alt, Backspace, Numlock, ScrollLock/Break, Enter, CapsLock, Ins, and Del keys. A Touchdown Keytop fits over the key and increases the height slightly (which may create a problem for some users). Each key's function is spelled out in plain English as well as with the PC keyboard's cryptic arrows.

Neither Keyfixer nor Touchdown caps are permanent. Keyfixer attaches with silicone adhesive, Touchdown Keytops, with a tapelike film.

The function keys are troublesome in a different way: I can never remember what they do. I've reassigned a couple, so the function key templates supplied with some of my programs no longer correspond to the keys.

A cheap solution would be a blank function key template, such as the one V&P Business Systems used to offer. The idea is nothing fancy, just a blank piece of heavy paper cut to fit around the function key area with 10 ruled boxes corresponding to the 10 function keys. You write in the function key assignments you've chosen.

Perfect Perfs

A common aesthetic problem is the unsightly perforation marks left by tractor-feed paper. I often end up hand-feeding a 25-page report into the printer using single sheets. Yes, I have looked into the possibility of buying a sheet feeder—but it costs \$1,500!

If you too are plagued by the ragged edges left by torn-off perfs, try micro-perforation paper, which has about 80 tiny perforations per inch instead of the usual half dozen. Once the tractor guides are removed from the paper, the manufacturers claim, it's indistinguishable from single sheets. Well, not quite—there's a slight fuzz visible if you look closely, and a dozen sheets stapled together have a

vaguely stubby feel. But most people will never know.

Cost varies by maker and quality. Prices are competitive with regular tractor-feed paper and with single sheets of good typing paper. A typical price for micro-perforation paper in packs of 1,000 or 2,000 sheets might be about 2 cents a sheet for 15- or 18-pound paper, 2½ to 3 cents a sheet for watermarked 20-pound bond (the best compromise between quality and cost), or 4 cents a sheet for even finer laid bond (letterhead quality) stock that can be imprinted with a company letterhead. That compares with 1 to 2 cents a sheet for 15- to 18-pound tractor-feed paper, and 3 to 5 cents a sheet for single sheets of letterhead-quality paper. MicroPerf is a common brand of micro-perforation paper. You should be able to find it at good office supply stores, and most computer-forms companies stock it. This is a far cheaper solution than buying single sheets of paper lightly glued (tipped) to a removable tractor-feed backing, which can run 20 cents a sheet.

Objection Overruled

Here's another paper problem: I often want to accurately overprint information on existing forms or figure the placement of printouts for brochures and mailers that have precise folds. But my printer prints in sixths, tenths, and twelfths of an inch while my ruler measures in eighths and sixteenths.

Radio Shack comes to the rescue with a \$2.95 Print Viewer word processing and forms ruler. This 15-inch ruler has scales in sixths of an inch for up-down measurements (most printers print six lines per inch vertically); tenths (pica-size type) and twelfths (elite-size type) for left-right measurements; an inch scale; and a line magnifier. The Print Viewer ruler is made of clear plastic.

If your local Radio Shack is out of stock, try the similar Pickett FL100 Computer Printout Ruler (\$4.95) or the C-Thru Business Forms Ruler (\$1.75), which, despite its name, is opaque. The C-Thru

ruler has holes corresponding to the sprockets on tractor-feed paper. Look for the Pickett and C-Thru at graphic arts supply houses.

As for the printer itself, whoever invented the "simple and universal" serial interface should be shot. I didn't buy my serial printer from the dealer where I bought the PC. The PC dealer wants \$40 an hour plus the cost of a special cable (another \$40) to make the printer run, and he says it might take 2 or 3 hours to install it.

The Smart Cable from IQ Technologies (\$89.95) is the answer to this costly problem. It figures out the pin connections and makes them—automatically. A logic module figures out what goes where and lights a combination of five LEDs. You flip two switches on the cable based on what LEDs are lit.

The Smart Cable is overkill if nothing trickier than a Hayes modem will ever grace your serial port, but it's a godsend if

you happen to have several recalcitrant printers.

The Smart Cable will not do three things: turn a parallel port into a serial port; tell you exactly what pins were connected so you can hard-wire a permanent cable; or set the baud rate, word length, and parity (you can do that in a minute by flipping switches on the PC and printer or modem).

Problem Plugs

Interfaces seem to be frequent trouble spots. For example, the plug on my color monitor doesn't fit the PC's power socket. My solution is a 12-inch adapter cord from Curtis Manufacturing (\$8.95) that accepts any two- or three-prong power cord. Don't use the adapter cord and a three-way plug to run a printer, lamp, and monitor off the PC, unless you like the smell of roasting circuit boards.

Another easily remedied problem is the glare from overhead lights that strikes the monitor screen and bounces off the desktop. Computer workstation lamps from Ledu and Luxo have ergonomically designed reflectors to throw light, not glare, on work areas.

Two to Avoid

These two accessories seem useful, but they can be harmful to you or to your computer.

In addition to gimmick accessories that neither help nor hurt you, here are two accessories you might want to steer clear of.

Terminal-top forms trays are handy, but not safe. The PC uses the top of the monochrome monitor for cooling. A tray to hold paper will block the cooling holes.

If you have another brand of PC with a cooling fan built into the monitor or with side vents that won't be affected by the forms tray, then by all means go ahead.

Diskette notch-punchers to convert a

double-sided diskette into two single-sided diskettes are a cute idea for PCs with single-sided drives, but possible problems loom.

On a single-sided drive, there's a tensioning pad on the side that doesn't read data. Minute amounts of crud could be transferred from the pad to the disk surface, and when the disk is flipped the disk might be unreadable.

There's also a slight chance that tiny bits of plastic from the disk jacket might break loose when the notch is punched, and cause problems with the disk.

—W.K.H.

Ledu makes both fluorescent and incandescent versions, the IPL600 (\$99.95) on a 28-inch swivel arm and the Asymmetric Lamp (\$64.95) on a 40-inch arm, respectively. Both clamp to the back or side of a desk.

Luxo's fluorescent CODE series is available on a 31-inch desk-mounted swivel arm (CODE 1, \$109.95) or with a 13-inch wall-mounted arm (CODE 2, \$94.95). CODE stands for "computer oriented designed environmental" lighting. From a side view, the CODE 1 lamp looks something like a long-legged, exotic tropical bird.

Although they are designed specifically for computer users, the lamps also work well for graphic artists or simply for reading in bed.

Limited desk space is probably the most common complaint among micro owners. Like many PC users, I only use my PC some of the time; the rest of the time I need the desktop free for paperwork or reading.

You can free up desk space by standing the PC on its side on the floor (it's safe) and putting the monitor on a movable tilting arm like a dentist's work tray. You can push the monitor aside when you don't need it, or share a monitor among up to four adjacent desks.

The fanciest solution is the PC Shuttle from Global Computer Supplies (\$285), which has a metal system stand, extension cables, a 30-inch reach, and an arm jointed in the middle. The monitor tray also has a chrome handle that pulls out to store the keyboard when it's not in use. The CRT Shuttle (\$235) uses the same setup, but doesn't come with the system stand and cables, which are a cut below IBM quality anyway.

The Monitor Mover from Lintek (\$129.95) is cheaper and less complex. Its unjointed arm has about a 24-inch reach. A companion System Sidekick, also from Lintek (\$79.95), hangs the PC system unit vertically on the side of the desk or bolts it underneath. Curtis Manufacturing makes a \$24.95 System Stand that rests the PC



Various cables available for the PC—including the Smart Cable—can take the headaches out of connecting peripherals.

OFFBEAT SOLUTIONS



vertically on the floor.

Maybe it's overkill, but the Monitor Mover also makes a great telephone stand.

Sweat of Your PC's Brow

Now you've solved all your problems, cleaned up your disks, and made yourself comfortable in your PC workspace. But before you get down to business, remember your PC's comfort. If you've installed extra circuit boards, your PC may overheat after running for several hours in a warm office. I know mine is getting hot under the collar when I begin to see data errors and disk drives that run by themselves.

Cool your system unit off with a sup-

The Under Carriage Keyboard Drawer from Microcomputer Accessories screws in place under a table or desk and pulls out for use, lowering the keyboard about 3 inches.

plementary cooling fan such as the PCool from Analytic Information Processing (\$99.95). It fits inside the PC and stirs up the air, preventing pockets of heat. The manufacturer claims that the overall temperature inside the system will drop about 15 degrees.

If you buy every one of these accessories, you probably won't be able to afford the PC. But chosen wisely, several of these elegant solutions should cure whatever ails your PC. ■

Don't use the adapter cord and a three-way plug to run a printer, lamp, and monitor off the PC, unless you like the smell of roasting circuit boards.

Product Information

PCool (supplemental cooling fan)

Analytic Information Processing

Box 966

Danville, CA 94526

(415) 837-2803

List Price: \$99.95

CIRCLE 729 ON READER SERVICE CARD

PA-1 Plug Adapter

Curtis Manufacturing Co.

305 Union St.

Peterborough, NH 03458

(603) 924-7803

List Price: \$8.95

Requires: Any monitor with standard 2- or 3-wire power cord.

CIRCLE 730 ON READER SERVICE CARD

SS-1 System Stand

Curtis Manufacturing Co.

305 Union St.

Peterborough, NH 03458

(603) 924-7803

List Price: \$24.95

CIRCLE 731 ON READER SERVICE CARD

Diskstand

Damomics

Box 132

Corning, NY 14830

(607) 524-6328

List Price: \$8.95

CIRCLE 732 ON READER SERVICE CARD

Easy Angle

Global Computer Supplies

9135 Hemlock Dr.

Hempstead, NY 11550

(800) 645-6393

(516) 292-3400

List Price: \$34.95

CIRCLE 733 ON READER SERVICE CARD

All the accessories mentioned are listed here, alphabetically by manufacturer.

PC Shuttle and CRT Shuttle

Global Computer Supplies
9135 Hemlock Dr.

Hempstead, NY 11550
(800) 645-6393
(516) 292-3400

List Price: \$285 (PC Shuttle), \$235 (CRT Shuttle)

Requires: Horizontal clamping surface with 1/4-inch rear clearance or accessory bolt-on stand.

CIRCLE 734 ON READER SERVICE CARD

Touchdown Keytops

Hooleon Company
Box 201 Dept. BH
Cornville, AZ 86325
(602) 634-4503

List Price: \$18.95 (plus \$2 shipping)

CIRCLE 735 ON READER SERVICE CARD

Smart Cable

IQ Technologies Inc.
11811 N.E. 1st St., #308
Bellevue, WA 98005
(800) 232-8324

List Price: \$89.95

Requires: Serial (RS-232C) port, serial device.

CIRCLE 736 ON READER SERVICE CARD

IPL600 fluorescent and 241 Asymmetric incandescent workstation lamps

Ledu Corp.
25 Linderman Drive, Box 358
Trumbull, CT 06611
(800) 222-5338
(203) 371-5500

List Price: \$99.95 (IPL 600), \$64.95 (241A)

Requires: Horizontal clamping surface, 1 1/2" clearance behind desk, or optional screw-on stand.

CIRCLE 737 ON READER SERVICE CARD

LM-100 Monitor Mover

LinTek Inc.
Box 8056
Grand Rapids, MI 49508
(616) 241-4040

List Price: \$149.95

Requires: IBM Monochrome Display (optional trays fit 17 other monitors), horizontal clamping surface, 1/4" clearance behind desk.

CIRCLE 738 ON READER SERVICE CARD

System Sidekick

LinTek Inc.
Box 8056
Grand Rapids, MI 49508
(616) 241-4040

List Price: \$79.95

Requires: Horizontal clamping surface, or screws to underside of desk.

CIRCLE 739 ON READER SERVICE CARD

CODE 1 fluorescent workstation lamp,

CODE 2 fluorescent workstation lamp

Luxo Lamp Corp.
Box 951, Monument Park
Port Chester, NY 10573
(914) 937-4433

List Price: \$109.95 (CODE 1), \$94.95 (CODE 2)

Requires: CODE 1 clamps to desk, requires 1 1/2" clearance behind desk, or use optional screw-on stand.
CODE 2 screws to wall or shelf.

CIRCLE 740 ON READER SERVICE CARD

Ergo-Mate

Mead-Hatcher Inc.
752 Military Rd.
Buffalo, NY 14216
(716) 877-1185

List Price: \$115

CIRCLE 741 ON READER SERVICE CARD

Disk Jockey

MicroComputer Accessories, Inc.
1545 Pontius Ave.
Los Angeles, CA 90025
(213) 477-4216

List Price: \$6

CIRCLE 742 ON READER SERVICE CARD

Rolltop 100 Disk File

Executive 100 Rolltop Disk File
MicroComputer Accessories, Inc.
1545 Pontius Ave.

Los Angeles, CA 90025

(213) 477-4216

List Price: \$36 (100), \$39.95 (Executive); \$10 additional for locks.

CIRCLE 743 ON READER SERVICE CARD

Under Carriage Keyboard Drawer

MicroComputer Accessories, Inc.
1545 Pontius Ave.
Los Angeles, CA 90025
(213) 477-4216

List Price: \$54

CIRCLE 744 ON READER SERVICE CARD

Print Viewer forms ruler

Radio Shack
One Tandy Center
Fort Worth, TX 76102
(213) 938-0857

List Price: \$2.95

CIRCLE 745 ON READER SERVICE CARD

Keyfixer

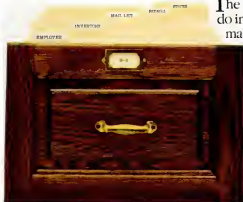
Vertex Systems Inc.
7950 W. 4th St.
Los Angeles, CA 90048
(213) 938-0857

List Price: \$14.95 (\$1.75 shipping)

CIRCLE 747 ON READER SERVICE CARD

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And you can arrange information in "forms" you design yourself. Or you can take advantage of PFS SOLUTIONS which are pre-designed forms for popular applications like inventory, invoices and ledgers. Either way, you can quickly and easily create the filing system that fits your needs. Not your computer's.

REPORT is the perfect companion program to FILE. Because it gives you the power to summarize and perform calculations on information you've stored with FILE.

With REPORT, you can create presentation quality summaries in table form in just minutes. Automatically sorted, calculated, formatted and printed!

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See your computer dealer for more details.



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New York Mets manager Dave Johnson uses a PC-XT and dBASE II to "play the percentages." His computer-aided batting lineups may usher in a new era in baseball.

The PC Goes to Bat

"There's total pandemonium here at Shea Stadium, where the Miracle of '69 has just repeated itself in '84! Impossible as it seemed just a few short months ago, The Amazin' Mets have done it again: they've won the World Series!"

The voice uttering these hard-to-believe words belongs to a network sports-caster covering the celebration in the Mets' locker room. But as he reaches to get a few words from the one most responsible for the team's success, he doesn't turn to the team's best pitcher or to its home-run king. Instead, his attention is directed at the screen of a PC-XT. "With 256K of hard-driving muscle and 16-bit spirit," he proclaims, "the PC-XT had by far the best numbers on the club."

The team drenches the XT's circuitry

with champagne. It answers no questions and quietly heads for the showers.

Playing the Numbers

Yes, a PC-XT will be accompanying the New York Mets this year as the team strives for the National League pennant. When the team's games are televised this season, take a close look in the dugout for that familiar beige box and monitor. It may rest between the water cooler and the rosin bags, or it may even be on the bench between Mookie Wilson and Darryl Strawberry, if the Mets' new manager Dave Johnson feels he needs it close by. Even if the XT is kept away from prying cameras, it will still be influencing game strategy from behind the scenes.

Dave Johnson is the eleventh manager for the Mets since Casey Stengel launched

this team of lovable losers in 1962. True to tradition, the team has dwelled in the cellar for the last two seasons under three different managers. Like the first Mets chief, who baffled the press with a twisted English called "Stengelese," Johnson too speaks some universal languages—namely, BASIC and FORTRAN.

Johnson is convinced—and he has convinced the team's owner—that he can increase the odds in the Mets' favor by compiling the right statistics and using them correctly. And he's uniquely qualified to prove it. Johnson, who graduated with a degree in mathematics from Johns Hopkins University, has chalked up as many hours working on IBM computers as he has hitting home runs throughout the major leagues. He slugged 42 home runs one season and played for the now legend-

PC AT BAT





While playing with the Baltimore Orioles in the early 1970s, Johnson developed mathematical theories about baseball that he will finally put to the test this year.



ary Baltimore Orioles teams from 1965 to 1973, and he batted during each of the team's World Series appearances during that period.

A Mathematical Brew

It was while playing with the Orioles in the early 1970s that Johnson first developed the mathematical theories about baseball that will be put to the big league test this season. He had convinced the Orioles' owner, National Brewery chairman Jerry Hofberger, to let him use the Baltimore brewery's IBM 360 mainframe at night. He used it to test a baseball game he had written in FORTRAN that was played exclusively with statistics. During these nighttime sessions, Johnson learned a great deal about how "playing the numbers" could influence any baseball team's performance under virtually all playing conditions.

What Johnson discovered was the importance of one statistic in particular—on-base percentage. It is the figure for the number of times a player reaches base for each time at bat, and it is the crux of Johnson's new-age managerial style. From a mathematical standpoint, he believes, the number is best applied to configuring the optimal batting lineup.

"It makes sense that if you bat the players in the order of the highest on-base percentage, and all the way down, obviously you'd get more guys to come up to the

plate. The more guys you can get up to the plate, the better chance you have to score runs," Johnson explains.

But the principles that Johnson had tinkered with on the computer didn't make it onto the field that season. Baltimore coach Earl Weaver was undaunted when Johnson arrived in his office one day with a printout from the brewery mainframe entitled "Optimization of the Baltimore Orioles Lineup." The readout listed all the lineup options, with statistical predictions for each lineup. Johnson hoped to show why he should be batting second in the championship team's batting order. Although the sales pitch didn't fly, ever since that time Dave Johnson has been known around front offices as someone who comes to business negotiations with a satchel full of computer tractorfeed.

Johnson came to believe that the ideal baseball manager should be able to combine the statistical prowess of Albert Einstein with the scrappy intuition of Casey Stengel.

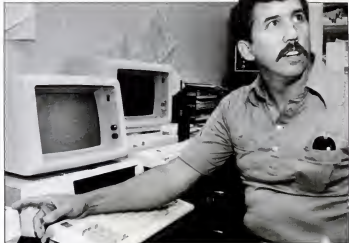
Though he knew baseball well enough to feel comfortable with the second part of this formula, he decided that when he managed a team he would give Einstein's part to a computer.

Ten Years Later . . .

Johnson finally got a chance to put his theories to the test last year, with the help of a PC-XT. He and the XT proved to be a winning combination in Tidewater, Virginia, where he coached the Mets' farm club, the Tidewater Tides, to two consecutive AAA Minor League team championships before his move to the majors this year. It was there that Johnson obtained his XT in exchange for public relations services for the local ComputerLand store. He then began to compile his BASIC baseball database, which became operational toward the end of the 1983 season. Did it help?

Johnson's answer is short but, as always, resolute: "You betcha."

His tinkering with computer-aided lineups and his winning streak in Tidewa-



Dave Johnson
that he developed

runs player statistics on his PC-XT, using a database
while managing the Mets' farm club, the Tidewater Tides.

ter may have attracted the Mets' front office to Johnson and his micro. Maybe the team management felt that the Mets' crop of young talent was a good choice for an experiment in computerized baseball

Johnson came to believe that the ideal baseball manager should be able to combine the statistical prowess of Albert Einstein with the scrappy intuition of Casey Stengel.

management. Perhaps they also figured that, considering the Mets' losing record, it was time to take a chance on something new.

The program Johnson will be using this season was written last winter in a com-

puter lab at the University of Central Florida in Orlando, by inveterate Mets fan and coordinator of computer services Lou Oddo, who was already well acquainted with filing systems for the IBM PC.

After signing on as Mets manager, Johnson went to Oddo's office with some formatted disks and the BASIC program he had been working on last season at Tidewater. He explained what he would need to manage the Mets, and Oddo went to work packaging the data and designing the protocol. Instead of working from Johnson's BASIC program, he designed something new using dBASE II.

Though Johnson is reluctant to reveal exactly what he's got hidden on disk for the Mets this season, he notes that there are, so far, two phases to the scheme.

First, before every game, the PC-XT will display a menu of opposing teams. Once Johnson selects the name of the team the Mets are playing, he'll get a listing of each pitcher on the opposing team, followed by a listing of every Mets batter's record against each pitcher based on various criteria—be it on-base percentage, slugging percentage, or runs batted in.

Second, Johnson will access a file of

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every Mets pitcher's record against every batter in the National League. After the game, every at-bat statistic (strikeouts, singles, doubles, triples, home runs, and walks) will be keyed into the database. There will also be room for special comments, ranging from game-winning RBIs to double plays and stolen bases.

Obviously, the Mets' database will be updated daily, but to prepare for this first season, the Mets management purchased 9 years' worth of National League statistics for Johnson to start with. In addition, the Shea Stadium XT may be supplemented by an XT-compatible portable for use on the road. Plans for tying into the Shea Stadium mainframe and going on-line to the Manhattan offices of the team owner have been nixed for now.

There are still plenty of details to be worked out, and both Johnson and Oddo have other databases they want to have filed—National League fielding statistics, for instance. There is a sense that a lot will be riding on this gaming experiment and that the future of baseball may change if the Mets succeed this season. And though Johnson eagerly admits he will be running the ball club with the PC-XT, he adds there is still plenty of management instinct involved.

"A lot of the managers get snowed by people in the computer business. They have some programmer giving them all the statistics on weather conditions, where the previous pitch was thrown, where to hit. You gotta be some kind of nut to start to apply all of that."

"I'm unique in that I know both mathematics and baseball. Statistics give a measure of predictability, but you still have to factor in the human element."

Despite the emphasis, it's strange to hear a baseball manager talk this way. The profile of the big league manager portrays a rough-and-ready tobacco chewer, not an ectuary. But, then again, why should Las Vegas bookies be the only ones to use micros to pick the winners?

"When you really think about baseball and computers," Oddo says, "you see

that baseball is a perfect sport to put on a machine. It's a statistic-oriented sport. It's the kind of thing to use a computer for. In baseball you always play the percentages. What plays the percentages better than a computer?"

Similarly, manager Johnson says he "wants to know the odds" throughout a ballgame. During spring training it was his dBASE II program that contributed to some surprising changes in the Mets' lineup. Johnson found that Mookie Wilson and Hubie Brooks were poorly placed at

It's one thing to
have your job elimin-
ated by a computer,
but it is quite another
when you learn
that it has called in



someone
to pinch-
hit in
your slot.

the beginning of the lineup because their on-base figures were less than 30 percent.

It is questionable how much the ball team appreciates the hard disk machine that's been serving up statistics on the manager's desk. It's one thing to have your job eliminated by a computer, but it's quite another to have it call in a pinch-hitter for your slot. Still, Johnson's faith in computerized team management is firm. "I don't care if the players are interested in the computer or not. I run the ball team."

And if the New York Mets creep up in the standings, will the XT get as much credit as the team's players?

Johnson answers without hesitation: "You betcha."

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Assembly Language: Putting the Macro Assembler to Work

Here are three useful new programs that will sharpen your skills and teach you 8088 commands. You'll also learn more about DEBUG and be introduced to procedures, calls, and returns.

In this issue, PC publishes its fourth and final excerpt from the upcoming book *Assembly Language Primer for the IBM PC* by Robert Lafore. The book will be published by The New American Library under the Plume! Waite imprint, copyright © 1984 by the Waite Group, San Rafael, California. All rights reserved. The previous three excerpts published in PC covered the introduction and Chapter 1, Chapter 2, Chapter 4, and Chapter 5. This excerpt covers Chapter 6.

In the last chapter of this book, we discussed the IBM Macro Assembler. Now it is time to put what we have learned on this topic to work. We'll start by writing a short program called BINI-HEX, which will take a binary number stored in the BX register and print it out on the screen as a hexadecimal number.



This program will introduce some new 8088 instructions and will also introduce you to the use of the T (for trace) command in DEBUG, a very powerful debugging tool.

When BINIHEX is successfully completed, you'll need a second program, DECIBIN, which takes a decimal number typed in at the keyboard and converts it to a binary value in the BX register. Again, this program will introduce new 8088 instructions.

BINIHEX and DECIBIN will be put together in a larger program, called DECIBIN, which will be able to take a decimal number from the keyboard and then print its hexadecimal equivalent on the screen. You will thus end up with a decimal to hexadecimal converter that can be called directly from DOS—a useful utility for those of you who are tired of

Assembly Language Primer for the IBM PC

Robert Lafore (The New American Library, Inc., New York, forthcoming) softcover. Price to be announced.

ASSEMBLY LANGUAGE

looking things up in tables.

THE BINIHEX PROGRAM

The purpose of BINIHEX is to take a binary number from a register in the 8088 and print it out on the screen in hex. A similar routine in DEBUG prints out memory addresses and their contents whenever you use the D command (and most other commands as well). BINIHEX is like a window into the 8088: through it you can examine the bits that constitute the contents of the otherwise invisible registers in the microprocessor chip and display them on the screen. The usefulness of this window is not limited to the decimal to hex conversion routine.

Rather than examine the ASM file as it should be typed in, take a look at the LST file that is produced when you assemble the program. With the machine language on the left and the original assembly language on the right, the LST file offers you the advantage of an immediate look at the machine language for the program. This saves you the trouble of examining two listings with overlapping information: one for ASM and one for LST. The listing appears in Figure 1.

Of course, to create the ASM file, you type in only the symbolic instructions from the right-hand columns. The numbers in the left-hand columns don't really exist until you've created the ASM file and assembled it.

Type in the program, and then assemble it with ASM, taking care to answer BINIHEX to the question about the LST file name.

A>asm binihex

— You enter this

The IBM Personal Computer Assembler
Version 1.00 (C)Copyright IBM Corp 1981

Object filename [BINIHEX.OBJ]:	— Press ENTER
Source listing [NUL.LST]:binihex	— Enter the program name
Cross reference [NUL.CRF]:	— Press ENTER
Warning Severe	
Errors Errors	
0 0	

When you print out the LST file, see if it's just the same as the one shown above.

Once the program is assembled, use the LINK program to create the EXE file and then the EXE2BIN program to create the COM file. (For a discussion on creating COM and EXE files, see "Assembly Language: The IBM Macro Assembler," PC, Volume 3 Number 7.) When you've finished, you'll have a COM file that can be executed from DOS and from DEBUG.

Operating the BINIHEX Program

Before finding out how the BINIHEX program works, you need to learn how to operate it. If you run the program directly from DOS, you should get a four-digit number printed out on

your screen, like this:

A>binihex
0000

The only trouble is, since this number is always zero, the program is useless if executed by itself from DOS. Getting into DEBUG will show what BINIHEX can do—eventually.

A>debug binihex.com

-g

0000

Program terminated normally

-

DEBUG produces the same result because the program is printing out the contents of the BX register, as it's designed to do, and the register is empty. We can put something in it by typing in a hex number, which will exist physically in the register in binary. Still in DEBUG, try this:

-rbx	— You type "rbx" to see the BX register
BX 0000	— It's zero
:1234	— Change it to 1234h
-	

Now, run the program again. (You might want to check that the IP register is set to 100 before you do this.)

-g	— Type "g" to run the program
1234	— It prints out the contents of BX
Program terminated normally	
-	— Back to DEBUG

It seems to work! Insert some other numbers, such as ffff or abcd, into the BX register, and then run the program. It should print out these numbers, too.

It may not seem that this program accomplishes very much.

```
.BINIHEX--Program to convert binary number
in BX to hex on console screen

0000                                program segment .start of segment

                                assume cs program

0000 05 04                          mov cx,4 .number of digits
0002 01 04                          rotate mov cx,4 .set count to 4 bits
0004 03 C3                          rol bx,cx .left digit to right
0006 0A 03                          mov al,bx .move to AL
0008 24 0F                          and al,0Fh .mask off left digit
000A 04 30                          add al,30h .convert hex to ASCII
000C 5C 3A                          cmp al,3Ah .is it > 9 ?
000E 7C 02                          j) printit .jump if digit > 9 to 9
0010 04 07                          add al,7h .digit is A to F
0012                                printit
0014 0A 00                          mov dl,al .put ASCII char in DL
0016 0A 02                          mov ah,2 .Display Output function
0018 02 11                          int 21h .call DOS
001A 7E 0D                          dec cx .done 4 digits?
001C 75 05                          jnz rotate .not yet
001E 7D 00                          int 20h .return to DOS

001E                                program ends .end of segment
                                end .end of assembly
```

Figure 1: The BINIHEX program listing.

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You put a hex number into the BX register with R, and the program prints it out, unchanged. Later, however, when a binary number has been placed in the BX register by another routine, printing it out in hex will provide new and important information.

How Does BINIHEX Work?

It's now time to examine the inner workings of the program. The flow chart of its operation is shown in Figure 2. There are four hex digits (16 binary digits) in the BX register. They should be printed out one at a time: first the one on the left, then the second from the left, and so on until all four are printed. First, rotate the entire contents of BX one hex digit, which is 4 bits, to the left. That puts the left-most digit in the right-hand place. For instance, if the number inserted into BX was 1234, after rotating it one digit to the left it would contain 2341. (When you rotate the contents of a register, the things that are pushed off one end re-enter at the other end. This is explained

further in the discussion of the ROL instruction.)

Changing the Hex Digit to ASCII

The 1 is the first hex digit to be printed, so move the BL part of the BX register into the AL register with a MOV instruction. The AL register is the preferred place to do arithmetic, since this register generally can perform 8-bit arithmetic faster than the other registers.

AL now contains 41h. The 4 is not yet important, so mask off the 4 with the AND instruction using 0fh (00001111 binary) as the mask.

Now the ASCII value of the printable character 0 (needed to print 0h) is 30h, the ASCII value of 1h is 31h, and so on up to 9h, which has an ASCII value of 39h. To convert these digits to ASCII, use the ADD instruction to add 30h to each of them. Except for one small problem, you can now send this number off to the Display Output function to be printed (using the PRINTIT instructions).

The small problem is that the digits are hex rather than decimal. The ASCII values of the first ten hex digits are in order:

digit	ASCII value (hex)
0	30
1	31
2	32
3	33
4	34
5	35
6	36
7	37
8	38
9	39

And the ASCII values of the last six hex digits are in order:

digit	ASCII value (hex)
A	41
B	42
C	43
D	44
E	45
F	46

Unfortunately, there is a gap between the two series of values: the difference between 3Ah (which is one past 9, where A ought to be) and 41h (where A actually is), is 7. So if the digit to be printed is a hex digit from A to F, 7 must be added to it to get the correct ASCII value. To find out if the digit is in the first

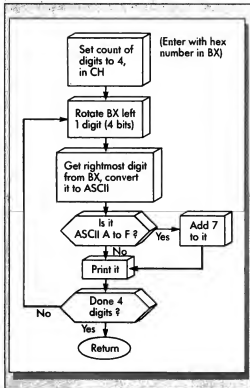


Figure 2: Flow chart of the BINIHEX program.

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series (0 to 9) or the second (A to F) use the CMP (for compare) instruction described below. If the contents of AL is less than 3Ah (the value that is one larger than the ASCII value of 9), then the additional 7 must be added. Otherwise, jump over this ADD instruction and go directly on to print the digit.

Once the first digit has been printed out in ASCII, rotate BX again to get the second digit from the left, which is 2, and print that. When you've printed all four digits, you're done.

NEW INSTRUCTIONS

To perform as described, the program needs some new 8088 instructions.

ADD Instruction

Adds two operands. Result (sum) is stored in leftmost operand.

To add contents of two registers:

```
ADD AL, BL
ADD BX, CX
```

To add constant to register:

```
ADD DL, 2Ah
```

To add register to memory:

```
ADD WORD, DX
```

Also, a number can be added to a memory address, and a memory address can be added to a register.

Flags affected: AF, CF, OF, PF, SF, ZF

The ADD instruction does just what you'd expect it to: It adds the contents of the right-most operand to the contents of the left-most operand and leaves the result in the left-most operand. Thus, if AX contains 20 and CX contains 30, after you execute the instruction

```
ADD AX, CX
```

AX will contain 50, while CX will be unchanged. Similarly, a constant can be added to a register (see "Assembly Language: The IBM Macro Assembler," PC, Volume 3 Number 7).

For the moment don't worry about the Flags part of this instruction box.

Note that the ADD instruction, like other arithmetic instructions in the 8088, performs *signed* arithmetic. That means that it thinks of the high-order bit (number 7 in 8-bit quantities, and number 15 in 16-bit quantities) as being a *sign* bit.

Thus (for 8-bit numbers) the number 01h is just +1, while the number Ffh is -1. 7Fh is just 7Fh (127d), while 80h is interpreted as -80h (-128d); 81h is -7Fh (-127h), and so on. This representation of signed numbers is called "two's complement arithmetic." The following table summarizes the way 8-bit numbers are represented.

Contents of Register	Arithmetic Value	Decimal Equivalent
00	0	0
01	1	1
...02...	...2...	...2...
7E	7E	126
7F	7F	127
80	-80	-128
81	-7F	-127
82	-7E	-126
...83...	...-7E...	...-126...
FD	-3	-3
FE	-2	-2
FF	-1	-1

Similarly, for 16-bit numbers, anything over 7FFFh (32767d) is considered to be negative. If you have the 16-bit number FFF0h, which is -10h, and you add it to 60h with an ADD instruction, the result will be 50h. And if the contents of a register is 0000, and you decrement it (subtract 1 from it) with a DEC instruction, it will become FFFFh, which is -1.

You don't really need to be a whiz at this sort of arithmetic to get along in assembly language. The important thing to keep in mind is that the 8088 considers those numbers whose left-most bit is *set* (=1) to be negative, and those numbers whose left-most bit is *cleared* (=0) to be positive.

The ROL Instruction

The ROL instruction takes the bits in a register and rotates

ROL Instruction

Rotates a register left.

All bits in register move left

Bits from left-hand end appear on right-hand end, and in the carry flag

To rotate 1 bit:

```
MOV DL, 1
```

To rotate more than 1 bit, put number of bits to shift in CL, register first.

```
MOV CL, 3
ROL BX, CL
```

them to the left. That is, they are pushed off one end, and they then rotate around to the other end. The bit pushed off the end is also placed in the carry flag. Think of the carry flag as a place to store a single bit. (In other instructions, called "shifts," the bits pushed off one end of the register disappear forever, and zeros are added at the other end.) The ROL instruction will rotate any of the registers: AX, BX, CX, DX, and also any of the 8-bit halves of these registers: AL, DH, and so on. It will

ASSEMBLY LANGUAGE

also rotate a memory address.

There are two ways to use this instruction. If you want to rotate only one bit, then you can write:

```
ROL AL, 1
```

(You can use any register you want, instead of AL.)

If you want to rotate more than one bit at a time (as in BINIHEX), you put the number of bits you want to rotate in the CL register before you execute the ROL. For example:

```
MOV CL, 4      ;rotate DH four bits left
ROL DH, CL
```

```
MOV CL, 8      ;rotate AX eight bits left
ROL AX, CL
```

The CL register acts as a count for the number of times to shift a register using a rotate or shift instruction.

The Flags

Flags hold the result of one instruction so another instruction can find out what happened. There are nine of these flags, but

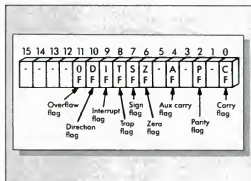


Figure 3: The flag register.

Flag Name	Set	Cleared
Overflow (yes/no)	OV	NV
Direction (decrement/increment)	DN	UP
Interrupt (enable/disable)	IF	DF
Sign (negative/positive)	NG	PL
Zero (yes/no)	ZR	NZ
Auxiliary Carry (yes/no)	AC	NA
Parity (even/odd)	PE	PO
Carry (yes/no)	CF	NC

Figure 4: The flag name table, showing mnemonics of the flag settings.

at this point you don't need to know about all of them. However, three or four are important, and you should be aware of the existence of the others.

The flags are 1-bit registers grouped into a single 16-bit register called, logically enough, the flag register. Since there are only nine flags, only nine of the 16 bits are used, scattered more or less randomly in the register. The reasons for this randomness are historical: The flags in the low part of the register occupy the same bit positions they did in the older 8-bit 8080 microprocessor. The flags in the high half of the register are new to the 8088. The flag register is shown in Figure 3.

The flags are *set* (meaning set to 1) or *cleared* (meaning set to 0), when certain instructions—mostly involving comparisons and arithmetic or logical operations—are executed. For instance, if you subtract two numbers, and the result is zero, then the *zero flag* will be automatically set, as in this program fragment:

```
MOV AL, 21
SUB AL, 21
```

That is, if you put 21 in the AL register and then subtract the same number from it, the result is zero, so the zero flag will be set—that is, it will contain a 1.

Accessing the Flags from DEBUG

It's possible to look at the flags with DEBUG to see how they're set and to change them if desired. Get into DEBUG and type *r* to see the registers:

```
A:debug
-r
AX=0000 BX=0000 CX=0000 DX=0000 SP=FFFF BP=0000 SI=0000 DI=0000
DS=00F1 ES=00F1 SS=00F1 CS=00F1 IP=0100
00F1 0100 03E8 AEO BP:BX
Flags
```

The two-letter mnemonics on the right in the middle row are the flag settings. The table in Figure 4 (which can be found in the DEBUG section of IBM's *Disk Operating System* manual, under "Register Command") shows what the mnemonics mean. The trap flag is not shown in the DEBUG display, so it is not listed.

You can change the flag settings in DEBUG using the *RF* command. When you type *rf*, DEBUG prints out all the flag settings and waits for you to type in a two-letter mnemonic, which presumably will be the opposite of one of the ones shown.

For instance, if you type *rf* and find that the sign flag is set to PL (for plus, meaning that bit #7 is 0), then you can set it to NG (for negative, meaning that the bit will contain 1), by typing *ng*, as shown:

```
-rf
NV UP DI PL NZ NA PO NC -ng
```

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You can check that the change was made with the R command:

```
-R
AX=0000 BX=0000 CX=0000 DX=0000 SP=FFFF BP=0000 SI=0000 DI=0000
DS=00F1 ES=00F1 FS=00F1 GS=00F1 IP=0100
NV UP DI NG NZ NA PO NC
```

Sign flag is now negative

The flags encountered most often here are the zero flag, the sign flag, the overflow flag, and the carry flag.

Once the flags are set, they can then influence other instructions, especially those called "conditional jumps." For example, there is an instruction JZ, for "jump if zero." If the zero flag is set, this instruction will cause a jump to the address specified in the operand field of the instruction. If the zero flag is *not* set, the instruction following the jump instruction will be executed.

The DEC Instruction

This instruction is frequently used in counting operations, where a total count is put in a register and then decremented

DEC Instruction

Decrements a register.

Can be used to subtract 1 from any of the 8-bit or 16-bit registers in the 8088.

```
DEC BX
DEC SI
DEC BL
```

Flags affected: AE, OF, PE, SE, ZF

each time some operation is performed. When the operation has been performed the specified number of times, the count in the register reaches zero, and this sets the zero flag. The zero flag can in turn influence the result of a conditional jump instruction such as JNZ.

You want to print four hex digits in BINIHEX, so, at the start of the program, put the number 4 in the CH register. Then each time a digit finishes printing, decrement the count in CH using the DEC instruction in location 18. Until CH reaches zero, the JNZ instruction in line 001A causes a jump back to the "rotate" label at location 0002, where another digit is printed. When CH does become zero, all four digits have been finished, so the next step is the INT 20 instruction in location 001C, which terminates the program. The DEC instruction is half of this process; the other half is JNZ.

The JNZ Instruction

The JNZ instruction is quite straightforward once the zero flag has been set to the appropriate value by some other instruction. If the zero flag is set to zero as a result of a previous arithmetic or logical operation, comparison, or increment or decrement *not* being zero, then the instruction following the

JNZ Instruction

Jumps if zero flag not set. (JNZ stands for "Jump if Not Zero".)

Jumps to the memory location in the operand field if the zero flag is not set.

```
JNZ DL, AGAIN
JNZ LOC2
```

Note: memory location to be jumped to must be within -128 or +127 bytes from the JNZ instruction.

The mnemonic JNE ("Jump if Not Equal") can also be used for this instruction.

JNZ in the program will be executed. If the zero flag is set to one, then the JNZ will cause a jump to the location specified in the operand field of the instruction.

In our program, JNZ will cause a jump back to the rotate label until the contents of CH becomes zero, at which time INT 20, the instruction following the JNZ, will be executed.

The CMP Instruction

This instruction compares the values in two registers and sets the flags according to the results of the comparison. For instance, if two numbers are equal, the zero flag will be set. Also, appropriate flags will be set to show if one number is larger than the other.

CMP Instruction

CoMPares two values.

Flags are set according to result of comparison.

To compare two registers:

```
CMP AL, DL
CMP BX, CX
```

To compare a register and an immediate value:

```
CMP AL, 11h
CMP CX, 10
```

To compare a register with a memory location:

```
CMP CL, BYTE
CMP BX, WORD
```

Flags affected: AE, CF, OF, PE, SE, ZF

One way to visualize what flags are being set by CMP is to imagine that the second (right-hand) number in the comparison is "subtracted" from the first (left-hand) number. The word "subtraction" is in quotes here because no actual subtraction takes place. The flags are changed as if the subtraction had taken place, but nothing is changed in the registers or memory. It's a phantom subtraction.

For example, if the AX register contains the number 200,

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and then the CMP instruction

```
CMP AX, 80
```

is executed, the sign flag will be set to PL (plus), since the result of subtracting 80 from 200 is positive. On the other hand, if AX contains 40, and the same instruction is executed, the sign flag will be set to NG (negative), since the result of subtracting 80 from 40 is negative. In addition, various other flags will be set, depending on the results of this imaginary subtraction. For instance, if the two numbers being compared by CMP are equal, the zero flag will be set, just as if one number had been subtracted from another, leaving zero.

Don't forget that no actual subtraction takes place when this instruction is executed. The contents of the registers used in the operand field remain the same; only the flags are changed.

The JL Instruction

There are two ways to look at the operation of this instruction. One is the official way, shown in the IBM *Macro-Assembler* manual. This states that this instruction will cause a

JL Instruction

jumps if X is less than Y where X and Y are the operands in a preceding CMP instruction. (JL stands for "Jump if Less than.")

Jumps to the memory location in the operand field if the sign flag is not equal to the overflow flag.

```
CMP AX, 8000h
JL  DOAGAIN      ;jump if AX less than 8000h

CMP CL, DL
JL  LOC2         ;jump if CL less than DL
```

Note: memory location to be jumped to must be within -128 or +127 bytes from the JL instruction.

The mnemonic JNGE ("Jump if Not Greater nor Equal") can also be used for this instruction.

jump only if the sign flag is not equal to the overflow flag. This may be true, but it's not the way you want to look at it when you're writing a program. Who knows when the sign flag will equal the overflow flag?

A more useful way to visualize the operation of JL is as the direct result of a CMP instruction. For example, imagine the following program fragment:

```
CMP AL, BL
JL  PURPLE
```

This is equivalent to saying, "If AL is less than BL, then jump to location PURPLE." The two items in the CMP statement read from left to right as if they were in plain English, with the inequality suggested by the jump instruction, in this case "Less than" placed between them. This is shown in Figure 5.

Thus, if AL contains 10 and BL contains 20, the jump to PURPLE will take place, since AL is less than BL. If AL contained 100 and BL contained 20, the jump would not take place. Thus, the CMP instruction and conditional jump instructions (such as JL and JG) work together to form program branches.

The BINIHEX program compares the ASCII character in AL with 3Ah, using the CMP instruction at location 000C, in order to find out if the digit to be printed needs to have 7 added to it. If AL is less than 3A, then the JL instruction in location 000E causes a jump to PRINTIT. If, however, the contents of AL are greater than or equal to 3A, the program goes on to the ADD instruction in location 0010, which adds a 7 to the ASCII value of our character.

USING DEBUG'S TRACE COMMAND

Sometimes something goes wrong in the operation of a program that you're writing, and it's difficult to discover exactly what it was by examining the listing. When you execute the program, everything happens too fast to see where the problem occurs. It would be nice if there were a way to execute a program one instruction at a time, so you could see the effect of each instruction in location 0010, which adds a 7 to the ASCII value of our character.

The operation of T is very simple: When you type the letter *t*, DEBUG will execute one instruction in your program. Type *t* again, and it will execute the next instruction. Each time it does this it also prints out the contents of all the registers, just as the R command does. The instruction executed is the one at the address contained in the IP register, so that by changing the contents of IP (with the RIP command) you can start tracing through a program anywhere you like. Once the program is started, of course, the IP is automatically incremented to the next instruction, just as it is when the program is running normally.

The BINIHEX program provides a nice example of the use of the T command. Call up DEBUG and BINIHEX.COM at the same time:

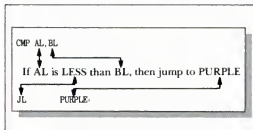


Figure 5: The CMP instruction leads to the JL instruction if the comparison is unequal.

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A>debug binihex.com

Before you start tracing you must first put a number into the BX register so you can watch the operation of the program as it prints it out. It's helpful if all the digits in the number are different, so you can distinguish them more easily.

```
-rbx
BX 0000
:1234
```

It is sad but true that you cannot use DEBUG to trace the operation of the DOS function calls. If you try, and you probably will, you'll find that you're tracing into all sorts of strange and wonderful places in your computer's memory, but that you never get back to your program! To avoid this problem, follow a simple rule: never try to trace an INT instruction.

The easiest way to avoid tracing an INT instruction is to put NOP (for "no operation") instructions in place of the INT 21 at line 0016. Because INT 21 requires two bytes, and NOP only one, we need to insert two NOPs, at 0016 and 0017.

```
-a116
0005:0116 nop      ← Enter first "nop"
0005:0117 nop      ← Enter second "nop"
0005:0118           ← Press Enter
```

If you are using DOS 1.0, you can use the E command to insert 90 into these two locations. (90 is the machine-language op-code for NOP).

The NOP Instruction

NOP is an instruction that does absolutely nothing. However, it takes up 1 byte of space in memory. It is useful when

NOP Instruction

Does nothing at all. (NOP stands for "No Operation")

Occupies one byte. Useful for replacing unwanted instructions.

you want to get rid of some instructions in memory without disturbing the rest of the program.

Operating the T Command

Now that the preliminaries are taken care of, tracing can begin. The IP should still be set at 0100, as it was when DEBUG was first loaded. If it isn't, change it with the RIP command.

To see the contents of the registers before the first instruction is executed in trace mode, start off the tracing session by typing *r*:

Note contents of BX

```
-r
AX=0000 BX=1234 CX=001E DX=0000 SP=FFFE BP=0000 SI=0000 DI=0000
DS=0005 ES=0005 SS=0005 CS=0005 IP=0100 NV UP DI PL NZ NA PO NC
0005:0100 B5B4 MOV CH,04
Start location
```

There's the 1234 you put into the BX register. CL contains 1E, left over from some previous operation, and AX and DX are empty. The IP is at 100, where it should be, and the instruction about to be executed is MOV CH,04. Type *r* and press the Enter key.

Here's the 4 in CH

```
-t
AX=0000 BX=1234 CX=001E DX=0000 SP=FFFE BP=0000 SI=0000 DI=0000
DS=0005 ES=0005 SS=0005 CS=0005 IP=0100 NV UP DI PL NZ NA PO NC
0005:0102 B1B4 MOV CL,04
```

Great—there's the 04 in CH, the high part of CX. Next, put 04 in CL:

Another 4 in CL

```
-t
AX=0000 BX=1234 CX=001E DX=0000 SP=FFFE BP=0000 SI=0000 DI=0000
DS=0005 ES=0005 SS=0005 CS=0005 IP=0104 NV UP DI PL NZ NA PO NC
0005:0104 D3C3 ROL BX,CL
```

And there it is. Now rotate the BX register left 4 bits, since 4 is the number in CL. Watch what happens to BX.

BX has been rotated

```
-t
AX=0000 BX=2341 CX=0404 DX=0000 SP=FFFE BP=0000 SI=0000 DI=0000
DS=0005 ES=0005 SS=0005 CS=0005 IP=0106 NV UP DI PL NZ NA PO CY
0005:0106 BAC3 MOV AL,BX
```

The 1 moved around to the right-hand side, and the other three digits shifted over to the left.

For the moment, the only part of BX needed is the 1, which is the first digit to print out, so copy BL to AL:

```
-t
AX=0041 BX=2341 CX=0404 DX=0000 SP=FFFE BP=0000 SI=0000 DI=0000
DS=0005 ES=0005 SS=0005 CS=0005 IP=0108 NV UP DI PL NZ NA PO CY
0005:0108 24F0 AND AL,BF
```

Mask off the extraneous 4 with an AND instruction:

Mask off the 4

```
-t
AX=0001 BX=2341 CX=0404 DX=0000 SP=FFFE BP=0000 SI=0000 DI=0000
DS=0005 ES=0005 SS=0005 CS=0005 IP=010A NV UP DI PL NZ NA PO NC
0005:010A 9430 AND AL,30
```

Add 30h to make it an ASCII character:

ASCII value

```
-t
AX=0031 BX=2341 CX=0404 DX=0000 SP=FFFE BP=0000 SI=0000 DI=0000
DS=0005 ES=0005 SS=0005 CS=0005 IP=010C NV UP DI PL NZ NA PO NC
0005:010C 3C3A CMP AL,3A
```

Now, find out whether the hex digit being printed is from 0 through 9 or A through F by comparing it with 3Ah.

```
-t
AX=0031 BX=2341 CX=0404 DX=0000 SP=FFFE BP=0000 SI=0000 DI=0000
DS=0005 ES=0005 SS=0005 CS=0005 IP=010E NV UP DI PL NZ NA PO CY
0005:010E 10B2 JL #112
```

CMP doesn't change any of the registers, but it does change the sign flag from PL (plus) to NGI (negative). That's how the

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JL instruction knows that the content of AL (31h) is less than 3Ah and to perform the jump to 0112 (rather than go on to the next instruction):

```
-t
AX-0031 BX-2341 CX-0404 DX-0000 SP-FFFF IP-0000 SI-0000 DI-0000
DS-0905 ES-0905 SS-0905 CS-0905 IP-0112 NV UP DI NG NZ AC PO CY
0905 0112 8A08      MOV     DL,AL
New address      Note that the IP register is changed to new address
```

It's almost time to print the digit out, using the Display Output function. Move the character from AL into DL (using the MOV command) and the code for the Display Output function, which is 2, into AH.

```
-t
AX-0031 BX-2341 CX-0404 DX-0031 SP-FFFF IP-0000 SI-0000 DI-0000
DS-0905 ES-0905 SS-0905 CS-0905 IP-0114 NV UP DI NG NZ AC PO CY
0905 0114 8A08      MOV     DL,AL
```

The INT instruction has been eliminated and the program passes over the two NOPs without incident:

```
Display Output function number.
-t
AX-0031 BX-2341 CX-0404 DX-0031 SP-FFFF IP-0000 SI-0000 DI-0000
DS-0905 ES-0905 SS-0905 CS-0905 IP-0116 NV UP DI NG NZ AC PO CY
0905 0116 90      NOP
```

```
-t
AX-0030 BX-2341 CX-0404 DX-0030 SP-FFFF IP-0000 SI-0000 DI-0000
DS-0905 ES-0905 SS-0905 CS-0905 IP-0117 NV UP DI NG NZ AC PE CY
0905 0117 90      NOP
```

To find out if all four digits have been done, decrement CH:

```
-t
AX-0030 BX-2341 CX-0404 DX-0030 SP-FFFF IP-0000 SI-0000 DI-0000
DS-0905 ES-0905 SS-0905 CS-0905 IP-0118 NV UP DI NG NZ AC PE CY
0905 0118 F6C0      DEC     CH
```

This does not change the zero flag from NZ to ZR, since the result in CH is 03; so the program jumps back to print another digit, starting at location 0102:

```
-t
Decrement number
AX-0030 BX-2341 CX-0404 DX-0030 SP-FFFF IP-0000 SI-0000 DI-0000
DS-0905 ES-0905 SS-0905 CS-0905 IP-011A NV UP DI PL NZ NA PE CY
0905 011A 75D6      JNZ     0102
Unchanged
```

And the program starts all over again:

```
-t
AX-0030 BX-2341 CX-0404 DX-0030 SP-FFFF IP-0000 SI-0000 DI-0000
DS-0905 ES-0905 SS-0905 CS-0905 IP-0102 NV UP DI PL NZ NA PE CY
0905 0102 9104      MOV     CL,4
New location after jump
```

You can trace through the process again, and watch the next digit get printed (not really printed, of course, because of the NOPs). By this time you should have gotten the idea of how the trace works, so try it on your own.

THE DECIBIN PROGRAM

A different program, called DECIBIN, accepts a decimal number typed on the keyboard and converts it to a binary number in the BX register. Combining this program with BIN-

HEX creates a decimal-to-hex conversion program. In higher-level languages like BASIC, this sort of conversion is built in, but assembly language requires a library of subroutines to plug into other programs as needed.

Type in the right-hand columns of the LST file in Figure 6. Then assemble, link, and convert it to a COM file in the same way as before.

Operating the DECIBIN Program

To use this program, you execute it, then type in positive decimal number less than 65535, and then press the Enter key (or any key other than a decimal digit). The program takes the decimal number you have typed in, 4096 for example, and converts it to its binary equivalent stored in the BX register. You can then examine the BX register with DEBUG to make sure that the program has done what it's supposed to do.

Since the output of the program is a number in the BX register, there is no point in operating the program directly from DOS. It would work, but you wouldn't be able to see the results. Thus, you should execute the program from DEBUG. However, there is a slight problem: If you load the program in with DEBUG, type the letter g to run the program, and then look at the BX register with the R command, you will find that it is always 0000. This is because when the INT 20 function terminates a program, it sets all the registers to 0000.

The answer to this problem is to stop the program before it reaches the INT 20. To do this, use another of DEBUG's features, called *breakpoints*. A breakpoint is a marker put in a program that says to DEBUG, "Execute the program normal-

```

DECIBIN--Program to get decimal digits
from keyboard and convert them
to binary number in BX

0000      program segment
          assume cs:program
0000 00 0000      mov     bx,0    ;clear BX for number

          ;Get digit from keyboard, convert to binary
0003      newchar
0003 04 01      mov     ah,1    ;keyboard input
0003 0C 21      scd     21h    ;call DOS
0003 40 30      sub     al,30h  ;ASCII to binary
0003 74 0F      jle     exit    ;jump if < 0
0003 75 0F      jge     exit    ;jump if > 9d
0003 7F 0C      jnc     exit    ;yes, not dec digit
0003 90          jmp     0102   ;flow to new digit

          ;digit is now in AL
0009      ;Multiply number in BX by 10 decimal
0009 03      shr     ax,bx    ;divide digit & number
0009 0A 0004    mov     cx,0004 ;push 10 dec in CX
0009 77 02      mul     cx     ;mul cx number times 10
0009 03      shr     ax,bx    ;divide number & digit

          ;Add digit in AX to number in BX
0017 03 0A      add     bx,ax  ;add digit to number
0017 02 0A      jmp     newchar ;get next digit

0018      exit
0018 0D 20      int     20h

001D      program ends
          end

```

Figure 6: An LST file containing the DECIBIN program.

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ly, but when you get to this point, stop the program and print out the contents of the registers, then go back to DEBUG." DEBUG does this by inserting instructions into the program that cause a jump out of the program to DEBUG at the specified point, and then immediately replaces those instructions with the original ones from the program once the point is reached.

You set up breakpoints at the same time you execute a program using the G command. To do this, simply type the address where you want the breakpoint after the g and before you press the Enter key. You can specify up to ten breakpoints at once this way, but only one is needed here. Execution should be stopped just before the final INT 20 instruction is performed, so a breakpoint should go right on top of the INT 20, which is at location 001B. To run the program, do this:

```
A>debug decibin.com      Load in DEBUG and the program
-g 11b                  Enter "g" and the breakpoint
65535                    Type the decimal number, press <Enter>
```

Once you press the Enter key, the program will be executed; but instead of terminating normally, it will be interrupted at the breakpoint, and DEBUG will print out the registers at that point.

```
AX=0100 BX=FFFF CX=000A DX=0000 SP=FFFF BP=0000 SI=0000 DI=0000
DS=0005 ES=0005 SS=0005 CS=0000 IP=011B  NV UP DI NG NZ NA PE CF
0005 011B C028          INT 20
```

BX contains FFFF, which is hex for 65535d, so it works! To try it on another number, set the IP register back to 100, since after the breakpoint IP will retain the address of the breakpoint, not the start of the program:

```
-F10
IP 011B
100
-g 11b
9
AX=0100 BX=0000 CX=000A DX=0000 SP=FFFF BP=0000 SI=0000 DI=0000
DS=0005 ES=0005 SS=0005 CS=0000 IP=011B  NV UP DI NG NZ NA PE CF
0005 011B C028          INT 20
```

Here 9 was typed and 9 showed up in the BX register.

How Does DECIBIN Work?

The operation of DECIBIN uses the following algorithm:

1. Put zero in BX register.
2. Get decimal digit from keyboard, convert to binary.
3. Multiply whatever was in BX before by 10d (0Ah).
4. Add new digit to BX.
5. Go back to step 2, unless a nondigit was typed, in which case the program is finished.

This works because each time a decimal digit is typed (instead of the Enter key), it says two things. First, it gives the program the value of the new digit in the one's column. Second, it tells the program that all the digits typed before must be moved one column left; that is, multiplied by 10d.

The 8088, bless its little heart, has a multiply instruction that can be used to multiply by 10d, which avoids the convoluted algorithms necessary with lesser microprocessors.

There are a few new instructions in DECIBIN, including the multiply, to be examined before exploring how the program works.

The SUB Instruction

This instruction is rather similar to ADD. You need to remember that the quantity in the right-hand operand is sub-

SUB Instruction

Subtracts right-hand operand from left-hand. Result (difference) is stored in left-hand operand.

To subtract contents of registers:

```
SUB AL, BL
SUB BX, CX
```

To subtract number from register:

```
SUB DL, 2Ah
```

To subtract register from memory:

```
SUB WORD, 0x
```

Also, a number can be subtracted from a memory address, and a memory address can be added to a register.

Flags affected: AF, CF, OF, PF, SF, ZF

tracted from the quantity in the left-hand operand (not the other way around). DECIBIN requires subtracting 30h from the ASCII code for the character that was typed in, in order to convert it to binary. This is done with the SUB AL, 30h in line 0007.

Notice that following this subtraction the flags are set just as if two numbers had been compared by a CMP instruction. So the JL EXIT in the next line will cause a jump if the contents of AL are less than 30h. The only way this could be true is if the character typed in was not a number at all, so the program is exited on characters less than 30h.

The JG Instruction

As you can see, JG can be thought of as the opposite of JL. Like JL, it can be interpreted in two different ways. You can think of it as causing a jump when the sign flag is equal to the overflow flag and when the zero flag is 0. Or you can use the more intuitive approach and think of it as jumping when the left-hand operand in a preceding CMP (or SUB) instruction is greater than the right-hand operand. (See the discussion on the JL instruction).

The DECIBIN program changes the ASCII digit that was typed in to binary. It's important to check if the digit is greater than 9, since if it is, it is not a decimal digit after all and the program should be exited. The program compares AL with 9d

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JG Instruction

Jumps if X is Greater than Y where X and Y are the operands in a preceding CMP instruction.

Jumps to the memory location in the operand field if the sign flag is equal to the overflow flag and the zero flag is not set.

```
CMP AX, 8000h
JG  DO_AGAIN    ; jump if AX greater than 8000h
CMP CL, DL
JL  LOC2        ; jump if CL greater than DL
```

Note: memory location to be jumped to must be within -128 or +127 bytes from the JG instruction.

The mnemonic JNLE ("Jump if Not Less nor Equal") can also be used for this instruction.

Flags affected: none

in line 000B, and if AL is greater than 9d, it jumps to exit via the JG EXIT instruction in line 000D.

The CBW Instruction

This is a useful instruction when you've been dealing with

CBW Instruction

Converts Byte to Word.

The byte must be in AL; the word is always in AX.
If the number in AL is positive, AH is filled with 00.
If the number in AL is negative, AH is filled with FF.

CBW

Flags affected: none

an 8-bit quantity (a byte), and you want to make it into a 16-bit quantity (a word). Eventually, the binary digit in the A register will be added to the binary number in BX, and both these registers must be words, since the ADD instructions can not add a byte to a word. The CBW instruction turns the byte in AL into a word in AX. Note that, assuming the number in AL is positive (bit 7 is zero), AH automatically will be set to zero by the CBW instruction.

XCHG Instruction

Exchanges the contents of two registers, or a register and a memory location.

Works on either 8-bit or 16-bit registers (the segment registers cannot be used).

```
XCHG AX, BX
XCHG CL, AL
XCHG WORD, DI
XCHG BL, BYTE
```

Flags affected: none

The XCHG Instruction

In order to multiply two words, one must be in AX and the other in some other register. There is a number in BX to be multiplied by 10, and the digit to be added to it later is in AX. The easiest way to handle this is to switch them, that is, exchange AX and BX. Then put the 10d into CX, and you're ready to multiply AX by CX. After that, switch AX and BX back again with another XCHG instruction. The effect is to multiply BX by 10. This process is shown in Figure 7.

The MUL Instruction

In DECIBIN, the 16-bit word is switched from BX into AX

MUL Instruction

MULTIplies contents of A register, and operand register or memory address.

To multiply bytes, one number is in AL, second is in 8-bit register, or in memory:

```
MUL CL
MUL BL
MUL BYTE
```

Result is a 16-bit quantity in AX.

To multiply words, one number is in AX, second is in 16-bit register, or in memory.

```
MUL CX
MUL BX
MUL WORD
```

Result is a 32-bit quantity, high half in DX, low half in AX.

Flags affected: CF and OF = 0 if high-order half of result is zero, otherwise they = 1.

and multiplied by 10d, which leaves the result, a huge 32-bit quantity, in DX and AX. The high half of the result, in DX, is irrelevant here since numbers larger than FFFF will not be converted. So ignore DX and switch the result in AX back into BX. Then add the digit that started in AX, switched to BX, and is now back in AX. The binary equivalents of the decimal digits that have been typed in so far are now in BX, and the program goes back to read another character, which will be either another digit or a nondigit that will exit the program.

THE DECIBIN PROGRAM

BINIHEX and DECIBIN now can be combined into a veritable giant of a program called DECIBIN, for "decimal to hexadecimal" converter. This program will use DECIBIN to get a decimal number from the keyboard and convert it to binary in the BX register, and then BINIHEX to print out the contents of BX on the screen in hex. Our plan is to take DECIBIN and BINIHEX and modify them slightly so they become procedures instead of programs. Then a short main program will be created that will call each procedure in turn.

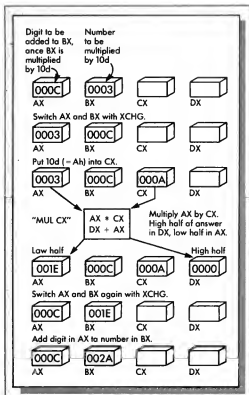


Figure 7: The operation of the DECIBIN program.

One more small addition remains: a routine to print a carriage return (cr) and linefeed (lf). The cr/lf combination is printed after the decimal number is received from the user; otherwise, the hex number—the hex equivalent of the number—will print on top of the original decimal number on the screen display.

The overall structure of the DECIBIN program is shown in Figure 8. As you can see, there's one main program and three procedures. The main program calls the three procedures in turn. See Figure 9 for the complete program.

You should be able to save a lot of typing by using your word processing program to merge the DECIBIN.ASM and the BINIHEX.ASM together and then adding the other parts of the program to them.

You'll notice that only one change has been made to the instructions in DECIBIN and BINIHEX: the INT 20 instruction at the end of each has been changed to a RET. That's

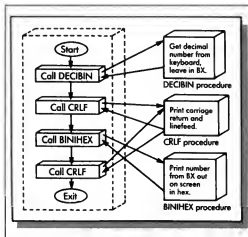


Figure 8: The structure of the DECIBIN program.

because INT 20 is used only to return from a main program to DOS or DEBUG. It doesn't work at all to return from a procedure, which is what is required at the end of DECIBIN, BINIHEX, and LFCR.

Type in the program, assemble it, link it, and convert it to a COM file.

Operating the DECIBIN Program

Your diligence in writing DECIBIN and BINIHEX now can be rewarded. DECIBIN does not require DEBUG to operate. You can use it from DEBUG if you want, but you can also invoke it directly from DOS.

Once it's loaded, the DECIBIN program will sit there waiting for you to type in a decimal number. Type in any number up to 65535d, then press the Enter key. The hex equivalent of the decimal number will be printed out on the next line. (Don't try to type in negative numbers: the program can't handle them. It will exit if you type any character except the decimal digits 0 through 9.)

A>decibex	← Enter name of program
4096	← Enter decimal number
1000	← Hexadecimal result will be displayed
10	← Enter another decimal number
000A	← Hex result printed out
'C	← Type Ctrl Break to exit
A>	← Back in DOS

The program will then wait for another number, and so on. To escape from the program you must type Ctrl-C or Ctrl-Break, since no escape mechanism was built into the DECIBIN program itself.

ASSEMBLY LANGUAGE

How Does DECIMEX Work?

The main part of program consists entirely of CALL instructions. These, along with the RETs at the end of the procedures, are the only new instructions in the program. There is also a new pseudo-op, called PROC.

The CALL Instruction

A CALL instruction is like a JMP to another memory location, except that in addition to jumping to a new location, the CALL instruction also stores the memory address of the location following the CALL instruction itself. It stores this address in a part of memory called the "stack." Think of the stack as simply a place to store addresses. The result is that when a RET instruction is executed at the end of a procedure, the 8088 knows what memory address to return to. The operation of CALL and RET in procedures is diagrammed in Figure 10.

There are two varieties of CALL instructions. Long CALLs are calls to procedures in a different memory segment than the calling program. (Ignore this possibility for the moment.) Short

CALLs are made to procedures in the same segment as the calling program, which is the case here. The tricky part is that, although long CALLs and short CALLs use different machine language op-codes, there is no difference in the way long calls

CALL Instruction

CALLs a subroutine.

Transfers control to the address of the subroutine in the operand field.

Also sets up return by placing address following the CALL on the stack.

CALL can be either short or long.

In a short CALL, the contents of the IP register are placed on the stack.

In a long CALL, the contents of, first the CS register, and then the IP register, are placed on the stack.

CAL SUBR

Flags affected: none

```

;DECIMEX--Main Program
;Converts decimal on keyboard to hex on screen
;*****
decimex segment
    assume cs:decimex

MAIN PART OF PROGRAM  Connects procedures
together

0000  E9 000E B      repeat call    decimex.keyboard to binary
0005  E8 0047 B      call    erif .print er and lf
0006  E8 002A B      call    binhex .binary to screen
0009  E8 0047 B      call    erif .print er and lf
000C  EB F2          jmp     repeat .do it again

;*****
;PROCEDURE TO CONVERT DEC ON KEYBD TO BINARY
;Result as left in BX register

000C      decimex proc    near

000C  B8 0000        mov     bx,0 .clear BX for number

;Get digit from keyboard. convert to binary
;newchar

0011      mov     ah,1 .keyboard input
0013      CD 21      int     21h .call DOS
0015      sub     al,30h .ASCII to binary
0017      jl      exit .jump if < 0
0019      cmp     al,9d .is it > 9d ?
001B      jg      exit .yes, not dec digit
001D      cbw     .byte in AL to word in AX
001D      .digit is now in AX

;Multiply number in bx by 10 decimal
001E      xchg    ax,bx .trade digit & number
001F      IMUL    10 .put 10 dec in CX
0022      mul     cx .number times 10
0024      xchg    ax,bx .trade number & digit

;Add digit in ax to number in bx
0025      add     bx,ax .add digit to number
0027      EB E8      jmp     newchar .get next digit
0029      exit:      .
0029      ret        .return from decimex
002A      decimex endp .end of decimex proc
;*****

;PROCEDURE TO CONVERT BINARY NUMBER IN BX
;TO HEX ON CONSOLE SCREEN

binhex proc    near

002A  B5 04          .number of digits
002C  B1 04          rotate    mov     cl,4 .set count to 4 bits
002E  D3 C3          rol     bx,cl .left digit to right
0030  BA C1          mov     al,bl .move to AL
0032  24 0F          and     al,0Fh .mask off left digit
0034  4A 30          cmp     al,30h .convert hex to ASCII
0036  3C 3A          cmp     al,3Ah .is it > 9 ?
0038  7C 02          jl      printit .jump if digit < 0 to 9
003A  4A 36          add     al,7h .digit is A to F

003C  BA D0          mov     dl,al .put ASCII char in DL
003E  B4 02          mov     ah,2 .Display Output funct
0040  CD 21          int     21h .call DOS
0042  FE C8          dec     ch .done 4 digits?
0044  75 E8          jnz     rotate .not yet

0046      ret        .return from binhex

0047      binhex endp

;*****
;PROCEDURE TO PRINT CARRIAGE RETURN
;AND LINEFEED

0047      erif proc    near

0047  B2 0B          mov     dl,0Bh .carriage return
0049  B4 02          mov     ah,2 .display function
004B  CD 21          int     21h .call DOS

004D  B2 0A          mov     dl,0Ah .linefeed
004F  B4 02          mov     ah,2 .display function
0051  CD 21          int     21h .call DOS

0053      ret        .return from erif

0054      erif endp

;*****
decimex ends
;*****
end

```

Figure 9: The complete listing of the DECIMEX program.

ASSEMBLY LANGUAGE

and short calls are written in the source (ASM) file. They are both just CALL. How then does the assembler know, when it sees a CALL, whether it is supposed to assemble a long call or a short one?

The answer is that it looks at the routine you have called to get its answer. And what exactly is it that you call? It's something called a "procedure." A procedure is a number of assembly language instructions, much like a program, that have been grouped together. A procedure usually performs a specific, well-defined task. In BASIC and some other higher-level languages, and in other dialects of assembly language, a procedure is often called a "subroutine."

The PROC Pseudo-Op

The PROC pseudo-op is used to identify procedures. The PROC pseudo-op is part of a pair: PROC and ENDP. They're used to surround a procedure, as in the example below:

```
SUB_NAME PROC    FAR    ;start of procedure
    (procedure goes here)
RET              ;(procedure ends with RET)
SUB_NAME ENDP    ;end of procedure
```

There are two kinds of procedures, NEAR and FAR. These definitions have to do only with how the procedure will be called with CALL and how it will return to the calling program with RET. If it is a NEAR procedure, it will be called with a NEAR CALL, and if it is a FAR procedure it will be called

with a FAR CALL. So the only real function of the PROC pseudo-op (besides setting off blocks of code to make the documentation of the programming a little clearer), is to tell the assembler whether CALLs to that procedure will be NEAR CALLs or FAR CALLs.

The RET Instruction

The RET instruction transfers control from a procedure back to the program that called it. This is possible because the address of the instruction following the CALL instruction is

RET Instruction

RETURNS from procedure.

Transfers control to the address on the top of the stack. This address was placed there earlier by a CALL instruction.

RET can be either near or far.

A near RET returns from a NEAR procedure, taking one word from the stack and placing it in the IP.

A far RET returns from a FAR procedure, taking the first word from the stack and placing it in the IP; then taking the second and placing it in CS.

RET

Optionally, RET can also pop additional values off the stack.

RET 12

Flags affected: none

stored on the stack. When the 8088 sees the RET, it simply looks on the stack and transfers control to the address it finds there. RET instructions can be NEAR or FAR. This is determined by the assembler, which looks to see if the RET is in a NEAR or FAR procedure. If it's in a NEAR procedure, the RET is assembled as a NEAR RET. If it's a FAR procedure, then it's a FAR RET.

PROC's, CALL's, and RET's

All the "nears" go together and all the "fars" go together. A NEAR CALL calls a NEAR PROC that returns with a NEAR RET, and a FAR CALL calls a FAR PROC that returns with a FAR RET. When writing a program the only thing you need to specify is the PROC; you must choose FAR or NEAR. The assembler will figure out the CALLs and the RETs.

The idea behind this is to make it harder to make a mistake. If you had to specify both the CALLs and the RETs, chances are you would mix them up sooner or later, and then your program would be in big trouble. Using the PROC approach means that the assembler has the responsibility of matching up the CALLs and RETs, and it, presumably, is infallible. PROC was invented to save you from yourself.

Since only one code segment is being used at this point, all

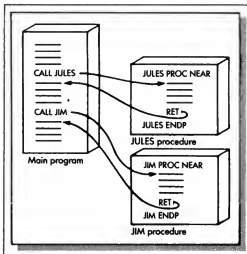


Figure 10: The operation of the CALL and RET instructions.

ASSEMBLY LANGUAGE

your PROCs, CALLs and RETs will be NEAR.

The operation of the DECIBIN program should now be clear. The four CALL instructions at the start of the program spell it out: Get a decimal number from the keyboard with DECIBIN, then print a cr/lf to move down to the next line; print the hex version of the number with BINIHEX, then print another cr/lf to get ready for the next input.

Note that DECIBIN leaves the binary equivalent of the decimal number in BX. It stays there, unchanged, because LFCR does not damage the contents of BX. Then, when BINIHEX is called, it finds this number in BX and converts it to hex. BX has been used to pass (transfer) a value from one procedure to another.

CROSS-REFERENCE: USING THE CREF PROGRAM

The CREF program is interesting, but it certainly is not essential to the operation of the assembler and the writing of short assembly language programs. But if you plan to write really long assembly language programs at some future time, then read on.

The CREF program is included on the disk with MASM and ASM and is described in the IBM *Macro Assembler* manual. The purpose of CREF is to produce a cross-reference listing of the symbolic names used in the program.

Of what use is a cross-reference listing? In short programs it isn't all that valuable. But when you're debugging a really long program it can be very useful. Suppose you find, for instance, that you need to change the symbolic name of a particular location in memory from REPEAT to DO_AGAIN. It's easy to change the REPEAT location itself, but what about all the references to it? You may have all sorts of JMP REPEAT instructions scattered throughout your program. The cross-reference file generated by CREF gives you an easy way to find them all.

The CREF program generates its cross-reference table using the line numbers in the program listing to refer to various locations. These line numbers are simply the ordinal number of each line in the listing, starting at the top. However, no such numbers appear on the LST files generated by ASM. You could count the lines yourself on the ASM or LST file, but this is rather tedious; it's the kind of thing computers are supposed to do for you.

It turns out there is a way to get the assembler to generate these line numbers: the PAGE pseudo-op. PAGE is used at the beginning of an ASM file, mostly to specify the number of characters per line and the number of lines per page in the LST file. One instance in which this might be useful is if you have a printer with 132 columns, and you want the LST file to use this increased width. If you don't change the width, use the PAGE pseudo-op without any parameters. This provides default val-

ues of 66 lines per page and 80 characters per line. This is just what you get if you don't use PAGE at all. However, using PAGE turns on the line-numbering feature.

The DECIBIN program that follows is somewhat different from the previous DECIBIN program shown. The beginning of the ASM file of this DECIBIN program shows how the PAGE pseudo-op is positioned at the start of the program.

```

                                page                ← Page pseudo-op
;DECIBEX--Main program
; Converts decimal on keybd to hex on screen
;
decibex segment
-----
;
main      proc      far
;
;          assume      cs:decibex
;
;MAIN PART OF PROGRAM.  Links procedures
; together.
;
display equ      2h      ;video output
key_in   equ      1h      ;keyboard input
doscall  equ      21h     ;DOS interrupt number
;
;          push      ds      ;ds on stack
;          sub       ax,ax    ;set ax=0
;          push      ax      ;zero on stack
;
repeat: call      decibin ;keyboard to binary
;          call      lfcr    ;print lf and cr
;
; . . . . . (balance of program deleted) . . . . .
```

Once you have PAGE in your ASM file, you can assemble the file and generate the cross-reference file. When you use the assembler you need to specify the CREF file name, as shown here:

```
A>asm decibex
The IBM Personal Computer Assembler
Version 1.00 (C)Copyright IBM Corp 1981
```

```
Object filename [DECIBEX.OBJ]: nul      ← OBJ file not needed
Source listing [NUL.LST]: decibex      ← Specify the LST filename
Cross reference [NUL.CRF]: decibex     ← Specify the CRF filename
```

```
Warning Severe
Errors      Errors
0           0
```

The first output file from the assembler that we're interested in is the LST file, shown in Figure 11. As you can see, it now sports line numbers on the left-hand side.

Unfortunately, these line numbers take up a lot of room, so that the comments on the right get chopped off on our 80-

ASSEMBLY LANGUAGE

```

1                                     page
2                                     :DECiHEX--Main program
3                                     :   Converts decimal on keybd to hex on
4                                     :
5      0000                          :decihex segment
6                                     :-----
7                                     :
8      0000                          main   proc   far
9                                     :
10                                     :       assume  cs:decihex
11                                     :
12                                     :MAIN PART OF PROGRAM.  Links subroui
13                                     :   together.
14                                     :
15      = 0002                        display equ   2h       :video output
16      = 0001                        key_in  equ   1h       :keyboard input
17      = 0021                        doscall equ   21h      :DOS interrupt
18                                     :
19      0000  1E                      push   ds       :ds on stack
20      0001  2B C0                   sub    ax,ax    :set ax=0
21      0003  50                      push   ax       :zero on stack
22                                     :
23      0004  E8 0012 R                repeat: call   decibin :keyboard to b
24      0007  E8 004B R                call    lfcr   :print lf and
25                                     :
26      000A  E8 002E R                call    binihex :binary to scr
27      000D  E8 004B R                call    lfcr   :print lf and
28                                     :
29      0010  EB F2                    jmp     repeat :do it again
30                                     :
31      0012                          main   endp
32                                     :-----
33                                     :
34      0012                          decibin proc   near
35                                     :
36                                     :PROCEDURE TO CONVERT DEC ON KEYBD TO
37                                     :   result is left in BX register
38                                     :
39      0012  BB 0000                  mov     bx,0     :clear BX for
40                                     :
41                                     :get digit from keyboard. convert to b

```

..... (balance of program deleted)

Figure 11: The LST file with line numbers created by PAGE.

ASSEMBLY LANGUAGE

column screen and on our 80-column printer. This is a rather serious problem. There's no point in sacrificing comments in order to have line numbers. The best solution would be to have a printer wider than 80 columns. In any case, the beginning of the LST file in Figure 10 has the comments cut off on the right to fit on the page:

The assembler also generated a CRF file. This is an intermediate step in the generation of the cross-reference file, which has the file extension REF. The CREF program generates the REF file from the CRF file.

<code>>cref decihex</code>	← Enter CREF and filename
<code>List (DECHEX.REF):</code>	← Specify the name of the REF file

The result is set forth in Figure 12. The line number where a symbol is defined is marked with a number sign (#). The other numbers are all the other line numbers in the program where that symbol is referenced. You can see that REPEAT occurs in line 23, and is referenced only in line 29 (as you can verify from the LST file in Figure 11). If you are writing really long programs, especially if you have a 132-column printer, CREF can be very useful.

Symbol	Cross Reference	1st	in definitions	Cref-1
INDEX		26	67	89
DECISION	23	34	94
DECISION	3	10	106
DISPLAY	15	83	99
DORSAL	17	44	84
EXIT	63	46	61
KEY_IN	16	43	
LPCK	34	27	32
MAIN	9	31	107
NEWMAR	42	60	
PRINTMT	79	81	
REPEAT	23	29	
UPDATE	73	86	

Figure 12: The REF file that the CREF program generates from the CREF program.

SUMMARY

This excerpt should have honed your skills with the Macro Assembler by giving you practice on three different programs: BINIHEX, DECIBIN, and DECIHEX, a very usable decimal-to-hex conversion program. ■

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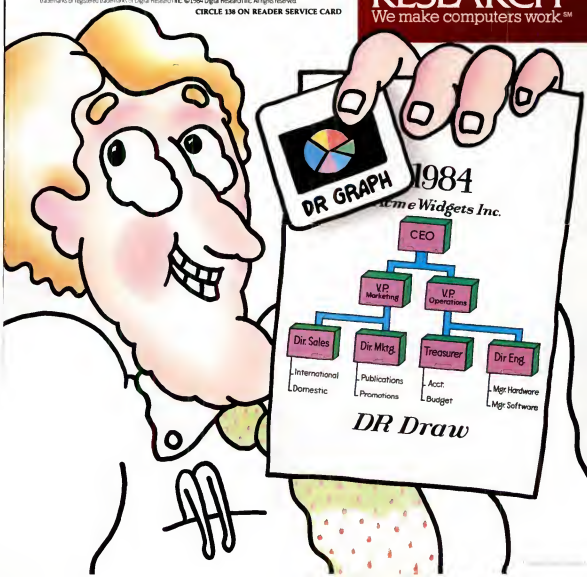
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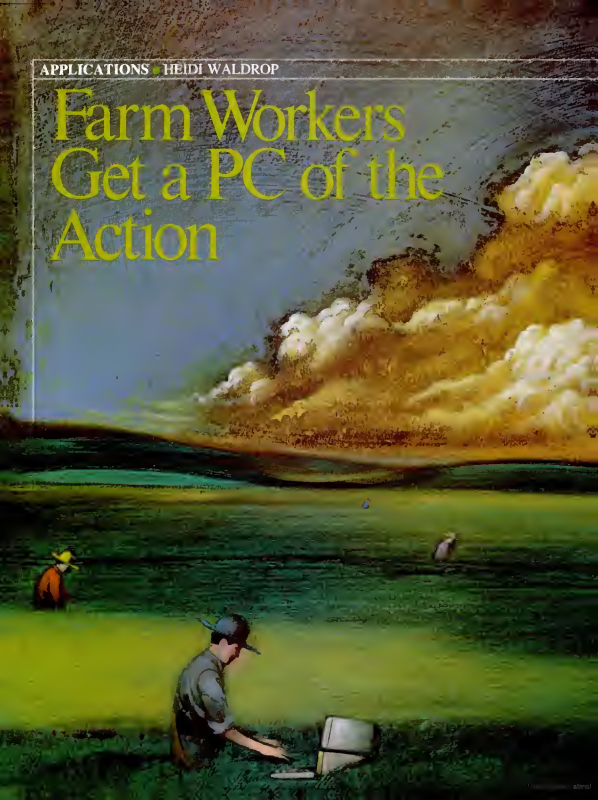
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APPLICATIONS • HEIDI WALDROP

Farm Workers Get a PC of the Action



The image is a full-page artistic photograph with a painterly, almost surreal quality. The upper two-thirds of the frame are dominated by a massive, dark, and turbulent sky. Swirls of dark brown, black, and grey clouds fill this space, with some lighter, yellowish-brown patches where light breaks through. The lower third of the image shows a flat, green field. Several small, distant figures of people are scattered across the field. In the foreground, two figures are more prominent: one on the left wearing a red shirt and a yellow hat, and another on the right wearing a blue shirt and a yellow hat. They appear to be working or walking in the field. The overall mood is one of vastness and drama, contrasting the small human figures with the overwhelming power of the sky.

The PC is an important contributor to two new educational programs aimed at helping migrant and seasonal farm workers make a better life for themselves.

FARM WORKERS

In John Steinbeck's famous novel *The Grapes of Wrath*, the Joad family finds itself locked into an unending cycle of migrant farm labor, poverty, and hardship. Today, some two million migrant and seasonal farm workers still work the land and suffer many of the same hardships—but creative uses of the IBM PC now offer them, and their children, a chance to improve their lot.



This may, at first, seem like an unlikely proposition. Migrant workers (who pick crops around the country) and seasonal workers (who usually stay in one region) make up a large proportion of the nation's unskilled agricultural labor force. According to the Association of Farm Worker Opportunity Programs, a group of private, nonprofit and state agencies, about 27 percent of these workers have very limited English language skills, 67 percent were school dropouts, and only 3 percent have any education beyond high school.

However, in spite of these considerable educational and social handicaps, a few pioneering organizations are attempting to introduce farm workers to new skills and provide their children with new services that will help them break out of the migrant cycle. In Arizona, for example, an innovative new program is training workers to use IBM Personal Computers and other office equipment to help prepare themselves for new careers.

PPEP TEC

"Technology is displacing large numbers of farm workers," who will need to find new livelihoods, said John Arnold, executive director and founder of the Portable Practical Educational Preparation Training for Employment Center (PPEP TEC). PPEP TEC is a group of three centers located throughout the state of Arizona that train workers on microcomputers

and other equipment. "For example," Arnold continued, "there is a new computerized drip-irrigation system in Arizona that is eliminating a lot of jobs. We're trying to turn the tables and say, 'Let's use that same technology to create jobs.'"

PPEP, the umbrella organization, started in 1967 in an old Chevy bus converted into a traveling classroom. On nights and weekends, Arnold, a former migrant minister with a Ph.D. in Education, drove to 15 farm-labor camps to teach classes in English and math and help the workers prepare for the high school equivalency exam.

About 3 years ago it became apparent to Arnold that PPEP needed updating. "Agri-business is becoming highly computerized. Micros are being used not only to control new irrigation systems, but to schedule planting cycles, and to help calculate inventory, costs, and marketing. Farmers have to fine tune their costs to be competitive. They need workers who can

work on computers as well as in the fields." And outside agriculture, there are many jobs in the Southwest for bilingual workers with computer skills.

In October of 1983, with funding from the Job Training Partnership Act through the U.S. Department of Labor, PPEP TEC's first PC-based computer-training center opened in Tucson to serve farm workers in southern Arizona. In February of 1984, two others opened in central Arizona's Casa Grande and the Navajo reservation of Ganado. A fourth center is scheduled to open on July 1 in Yuma, serving western Arizona.

Each center is equipped with at least six PCs with 128K and two disk drives, along with peripherals such as dot matrix printers and at least one letter quality printer. Arnold says he chose the IBM PC for the program because of its expandability. "The selling point for me was that it had a lot of add-on capabilities," he explained. "IBM personnel are helping us learn how to use the equipment. Also, we felt that once the student learned the PC keyboard, it would be very easy to convert to any micro. It's a good first computer."

Between 15 and 20 students attend each PPEP TEC for 6 months. Students are paid \$3.35 per hour to allow them to study full time without having to work in the fields. "First, we do an employment development plan and talk about what the student wants to do as a career," said Arnold. "Then we look at what is realistic for that individual to do and couple it with the needs of the job market."

Tri-lingual

PPEP TEC offers a trilingual program (English, Spanish, and Navajo) that is tailored to each student's needs. One person may concentrate on accounting and another on secretarial skills, but all must learn to use the PC. "In the old days, students would get on the PPEP bus and learn the basic skills they needed to survive. Today we're teaching more about computers because they need that knowledge to survive in today's market," Arnold added.

In addition to basic computer literacy, the students are also learning *WordStar*. PPEP TEC is now in the process of choosing software packages to teach accounting and database management. It is also looking into ways to use the PC for computer-assisted instruction of fundamental subjects such as English and math.

Christina Lugo, a teacher and director of PPEP TEC—Southern, finds teaching students to think with a computer is more difficult than teaching actual computer skills. "With a computer you really have to think things through," she said. "For most of the students, who have worked manually for years, it's more a matter of getting their brains going again."

"People tend to ask, 'How well could farm workers run a computer?'" Arnold said. "Actually, they're no different than anyone else except for two things: They're used to a very strong work ethic—many of them work 10 to 15 hours a day in the fields—and when they're given an opportunity like this, they're very dedicated."

Business Advisory Council

To keep in close contact with the business community, each PPEP TEC has a Business Advisory Council comprised of potential employers. PPEP TEC—Southern's council chairman is the personnel director for IBM's Tucson plant. Other councils include representatives from Hughes Aircraft, Lear Jet, and local real estate companies and department stores. The councils help determine the curriculum and place graduates; and their members advise students on office orientation, interviewing and resume-writing skills, and dressing for success inexpensively.

All this industry support makes a difference. PPEP has a 96 percent placement rate for migrant workers, and employers are apparently taking note of the new PPEP TEC computer students. As of early March, three workers had already been hired in computer-related jobs, and several others have been guaranteed employment upon graduation. "Some employers wanted to hire workers during their 2-

week internships, but we discourage that," said Arnold. "We want them to look forward to finding a career, not just a job. However, if after 4 or 5 months of classes they find a really good job that fits into their training schedule, that's fine. It's ultimately up to the individual."

PPEP TEC is working to draw more students into the program. They have recently started offering 2-month mini-modules on the PC to get migrant workers interested in the 6-month training session. "We're providing the class to arouse interest and show them that it's not difficult. We want the displaced workers to get a taste of computers and see that they are nothing to be afraid of, but rather a career option," said Lugo.

Helping Children, Too

The PC is also helping with the children of migrant farm workers, who may change schools as many as five times a

year. Many must help out in the fields whenever they can, often instead of going to school. Taking into account their frequent moves from school to school and their even more frequent absences, it's no wonder that the children have little opportunity to complete their educations.

To alleviate this situation, the Migrant Student Record Transfer System (MSRTS) was organized in 1970 to keep a central file on migrant children for the U.S. Department of Education. It now has approximately 850,000 records on file. Bill Woolley, a former educator and the MSRTS Regional Coordinator for five states, explained, "The system was needed so that migrant children who were moving from one school district to another would get their data transmitted from one school district to the next."

In its early years, MSRTS gathered data any way it could—mail, courier, telephone, and teletype. This presented

A Juicy Story

There's a little bit of PC-XT in every glass of Florida orange juice.

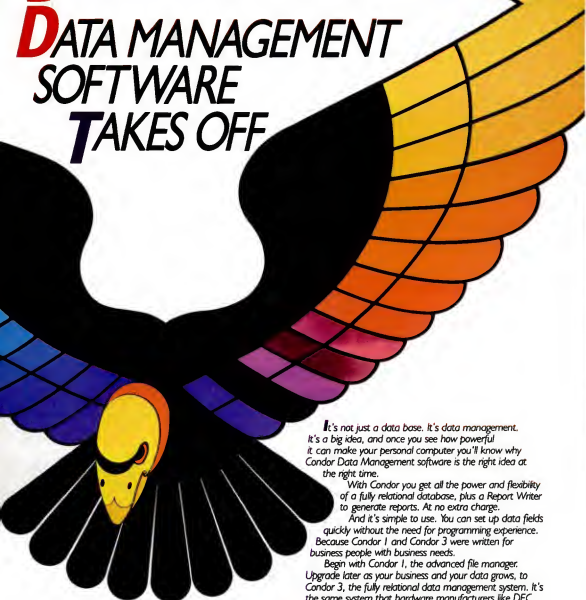
The IBM PC-XT plays a determining role in whether you get your morning orange juice. Because of a new XT at Florida's Department of Labor, the flow from orange tree to kitchen is running smoother.

Florida provides about 54 percent of all the nation's farm labor contractors with their federal licenses. Without these licenses, they can't hire workers to pick produce. Until last April when the XT went on line, licensing was running as much as 2 months behind, an eternity in the short citrus harvest season. Now, the XT is catching up on the lagging licensing and is efficiently churning out licenses every week.

The state is also building a database of the farm labor contractors as they annually renew their licenses. Within a year the list will be complete. Each week after that, the state's mainframe computer will automatically transmit to the XT a list of the licenses that need to be renewed.

The system is working so well that Florida hopes to get a contract to federally license all the farm labor contractors across the country, says Chuck Birchfield, supervisor of Crew Labor Registration and Compliance. That would mean that all the produce pickers in the United States would be processed by the PC-XT.—H.W.

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FARM WORKERS

problems, according to Wooley. "The parents would move so fast that the records couldn't keep up. The children would get immunized all over again every time they showed up in a new school, and they'd spend their time sitting in a corner waiting for tests and evaluations that had already been done. And before the teacher could figure out what needed to be done for them, the children were gone."

This spring MSRTS installed 100 IBM PCs in 80 sites in states all across the country (states with large migrant populations have several sites with additional IBM 3276 and 3278 terminals on-line to the host IBM 3033 mainframe).

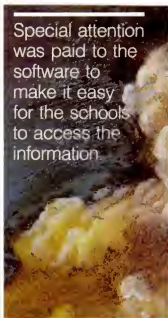
MSRTS uses the Remote Job Entry section of the Systems Network Architecture Synchronous Data Link Control communications package to equip their PCs to act alternately as terminals for the mainframe and as separate workstations. That way, operators can build transactions on a disk any time they want to and then link up directly with the host computer to transmit and request data.

The full-time operators at each site gather requests for children's files, their ID numbers, and updated information from the schools in their state and then transmit it by modem to the mainframe in Little Rock, Arkansas. The mainframe stores the transactions until it can process them, usually within a few hours. If a file printout is needed, it is mailed to the school the same day.

Special attention was paid to the software to make it easy for the schools to access the information. "User friendliness was the driving force," says Richard Woods, one of the two-member team that developed the PC software. "It's a fairly complex system and the operators are generally people in the state education office with no previous computer experience who were specially trained to work only with the PC."

One of the main problems with the PC's predecessor, the Texas Instruments Silent 700 terminal, was that the users had to format all the information themselves.

Woods was determined to make it easier. Now the PC does all the formatting and even goes one step further. "It won't let you get it wrong," he says. "All the user



has to do is fill in the blanks. If you miss one, it takes you back." For instance, if the user tries to enter an alphabetic character in a numeric field, the program explains the error at the bottom of the screen and returns the user to the field where the error was made.

The first thing operators do after booting up and inserting a disk is to enter the date, the time, and their password. Then they are presented with an analysis of what is on the disk they have inserted including what number disk it is, how many transactions have been built on it to that point, what percentage of the disk has been used, how many transactions have been transmitted to the host computer, and how many transactions have not been responded to by the host. Operators are then given the option of inspecting another

data disk, formatting a new disk, or continuing on that one.

Then, a master menu appears on the screen. Users can choose to input data; use the terminal statistic section to look up transactions they processed on a previous day; request the names of personnel; request the addresses and phone numbers of state agencies, schools, and health care providers in the facilities file; add or delete data to update the facilities file; or request a list of the materials used in reading and math at any particular school. They can view responses to transactions, use the communications function to transmit information, or end the session. The host computer responds to each of these menu choices.

How It Works

When a child arrives at a new school the teacher calls the state MSRTS office and requests the proper file using the child's 8-digit, 3-letter identification number. If a child doesn't know the number, the operator enters both the child's name and the child's parents' name. The mainframe does a search and sends the school a list of possible matches. If no match is found, then a number and file are created for the child.

Each child's file contains two sections: one concerning educational records and one dealing with health records. The education section stores a list of numbers that identify the student's math, reading, oral language, and early-childhood skill levels. A list of standardized test scores and an area for recording special talents are also included. The health section of the file lists patient and family medical history, including illnesses, injuries, and immunizations.

"For example," said John Wooley, "if there is any health data that the school ought to know about right away, we'll send it down the line and the operator can pick up the phone, call the school district, and say, 'This child was exposed to measles at his last school', or 'that child had chronic bronchitis last September and

needs to be given a checkup'.

"Unfortunately, we have many instances where children move away still needing health care. The parents can't stay if there's no work, so they pack up and go. We can send a message to all our machines at once, looking for the child. And we have a very high find rate. Generally, the parents are receptive to the services of migrant education. They understand that nobody is trying to pry, and that the federal government can't get into our machines."

"It's an important service," agrees Joe Miller, director of the MSRTS network. "Many of these children never got past seventh grade before this program. Teachers knew they probably wouldn't be there very long and had trouble deciding which class to put them in. Now a child can progress from school to school more smoothly."

In the next few months MSRTS plans to add another feature to the network that will allow the states to communicate more directly with each other. Currently, the host mainframe can leave a message for each of the PCs, but with the new addition a PC in New York could leave a message for one in Florida with the mainframe in Little Rock, which would store it in the outbound Florida slot until a PC from that state linked up. This feature could be used to trace a child who moved before getting needed medical attention, or to check on some fact without having to go to the host computer. Woods and the other systems planning people at MSRTS are working on other enhancements to help keep education running smoothly for migrant children.

The plight of the country's migrant and seasonal workers—poorly paid, poorly educated, and poorly treated—has not been bettered by the mechanization of America's farms. But, with the help of organizations such as PPEP TEC and MSRTS, and the IBM PC, these workers may be able to use microcomputer technology to improve their lives instead of making them worse. ■

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come to virtually dominate the writer's trade. Between 40 and 50 percent of all authors in the United States now write on word processors, according to the Association of American Publishers. Half the nation's yearly 30,000 Ph.D. dissertations are prepared on computers; so are half the articles in scientific and technical journals. Publishing houses, enthusiastic about the promise of lower costs and new electronic markets, are encouraging the trend.

But as the screening of America continues apace, few have noticed that the new electronic medium has an ominously

revolutionary message.

Since the invention of writing, the process of recording words has implied a certain permanence, whether the writer was engraving on stone, inking a papyrus, or typing onto a sheet of paper. The physical difficulties of altering a written thought have given authors a sizable psychological investment in the finality of each expression. They have made composition a slow, deliberative, linear, and logical art in which each sentence is assembled in the mind as a complete unit before a single letter is written. Until recently, most writing has been done in black on white typescript, which is reassuringly similar to the final product, a printed page. This similarity has enhanced the writer's sense of continuity.

None of these physical limits applies to the act of writing on a PC, on which every expression is endlessly and painlessly malleable and thus intrinsically impermanent. On a PC, the ease of moving words and blocks of text also makes the initial order of thoughts and aptness of phrasing irrelevant. Moreover, the word-wrapped array of glowing green phosphors on a dark field is utterly unlike the final form of the document.

No wonder, then, that word processing affects nearly every aspect of the writing experience, from the author's mental state to the style and structure of the finished manuscript. No wonder, either, that new users' reactions range from astonished delight to outright agony.

Getting Started

Before he got his computer, Maryland architect and consultant Jess McIlvain was scared to write, although his occupation required plenty of written work. He needed to put random ideas on paper before he could organize his reports, but his initial drafts were a frustrating assemblage of, he says, "many tedious scratch-outs, with arrows pointing to inserts," and he was too inept a typist to fix them. His embarrassment at handing the mess to his secretary grew into fear. "I just could not


write articles of any length. I could never sit down and compose at the typewriter, because I was worrying about making mistakes and getting around the keyboard." His anxiety was compounded when he forced himself to produce: "When I got through, the manuscript looked like the cat had walked over it."

But 2 years ago McIlvain encountered the IBM PC's forgiving, infinitely erasable screen, and the phobia disappeared: "I found I could just sit down in front of the PC and the thoughts kind of flowed," not logically, perhaps, but "like a subconscious transmission." Now McIlvain writes not only 300 to 400 page reports, but articles for trade journals, computer magazines, and the Washington area's 2,500-member Capital PC User Group.

Biographer Jane Howard had a similar problem. "I used to type the same material over and over. Until I loved one page, I couldn't go on to the next." But in the

What has been a revelation for McIlvain and Howard has proved a nightmare to fiction writer Harold Brodkey, a frequent contributor to *The New Yorker* who bought a DEC Mate out of financial desperation: "In one month I spent \$1,000 on typists," he says. But despite the dollar savings, Brodkey never adjusted to the machine, and for 2 years has "had a terrible time making the transition." He, too, became temporarily obsessed with spewing words directly from brain to screen. But since the medium gave him no incentive to make each line absolutely coherent, he sank into increasing sloppiness. "You never know what sequence of meanings you'll get in a paragraph of five sentences." So Brodkey still writes original drafts in "some combination of typewriter and pencil," putting them in the computer only to get a printout for editing.

He concedes some gains. "Where it really pays off is in moving dialogue



pdike writes a draft by hand and reluctantly feeds it into the word processor for editing.

fall of 1982, she bought a Kaypro computer to keep notes for her forthcoming book, *Margaret Mead: A Life*, and suddenly, she says, found it "very freeing to just sit there and free-associate—about anything, not just about writing. I've even taken to writing down my dreams on it." Not only does Howard's writing move much faster on the computer, but being forced to learn the rigorous logic of CP/M and other software ("so antithetical to my normal way of thinking") has made her "marginally more organized," she says.

around or breaking up long paragraphs of description. And the ease of revision does allow you to work with ideas of more subtlety." Brodkey says the computer promotes greater variety of tone and sentence rhythm, including, in his case, "a sudden resurgence of the subordinate clause." But he feels that, for writers like himself who tend to brood over their writing, the potential benefits are exaggerated: "Once you invest this kind of money in a computer, you'll go to any lengths to prove that it's useful."

Like Brodkey, writer/lecturer David Stang suffered a bout of techno-trauma after buying a microcomputer, but emerged instead an avid devotee. A Ph.D. in psychology who now conducts executive seminars in micro systems and software, Stang had written half-a-dozen books and some 50 journal articles by hand on yellow legal pads, paying as much as \$6,000 a year for typing. His prose was suffering along with his wallet: "Since it was going to cost \$1 a page to fix little things I didn't like, I'd just leave 'em." Finally, in 1979, Stang said, he decided "This is crazy" and bought a computer.

At first, he says, "I found it unnerving that the micro was always waiting for me—I felt more stressed by the presence of the hungry screen. When I was writing by hand, my body was permitted the luxury of thinking while I wrote—there was nothing waiting for my head to think of the next sentence." But the computer also had its compensations. "My quality really went up because of the ease of revision," he says, and his output increased because he no longer had to proofread the typist's material. "For every 30 corrections I'd make, she'd fix 15 and add five new problems—a whole day went down the tubes in proofing."

Soon Stang was composing directly at the computer. Armed with search and block-move functions and an index generator, he could begin even a long book project by typing in notes at random, since, he says, "I no longer had the obligation to start at the beginning—or even to know what my outline was."

The same was true for noted author James Fallows, Washington editor of *The Atlantic*, who has written on micros for 5 years. "I'd always worked on a typewriter before, I never had a pen-and-pencil stage. It took me 3 to 4 months when I first got the machine at the end of 1978 to feel comfortable doing first drafts on the computer." But it perfectly suited his methods: "I type a sentence over and over again until it's right. I used to have one

sentence on this page, two on that—and I'd spread the pages all over, dreading that awful stage of retyping the manuscript."

Now Fallows finds he thinks more clearly at the screen. "Recently, I had to do some writing with a pencil and legal pad, and the result was much more disjointed and jerky than usual." Despite the disdain of "some fans of the quill pen school," he finds the computer intrudes "no mechanical impediment between you and the words, so it's easier to keep the train of thought and rhythm in mind."

That method wouldn't work for crime novelist Dick Francis: "I still do my writing in a notebook and do it on the word processor later," he says. "I couldn't put it on the machine straightway, because it just wouldn't fit in with my style of life. I write sitting on the stairs or while walking by the sea." Why have a computer at all, then? "People can't read my writing—I can't take it to a typist," he says. Francis bought a Radio Shack computer a few years back to store the research notes for his novel *Twice Shy* (Putnam Publishing Group, 1982), and then "as my familiarity with it grew, I started using it for manuscripts." Its greatest advantage is that he can send identical printouts to his American and British publishers.

Francis's preference for manual methods is typical of many authors whose careers were established before the PC explosion. Erica Jong "uses good old pen and ink," says her assistant, Bardi McLennan, who types Jong's poetry or prose into an old Savin dedicated word processor. Jong then edits by hand on printouts. John Updike also writes his first drafts in longhand or on the typewriter and then, with a decided reluctance, feeds it into the word processor for editing.

Coping with the Screen

"Upright on a green screen, the words look quite different from the way they do flat on a piece of paper," Updike says. "The Gutenbergian ethos will be sorely missed, at least by me."

"Quite different" is quite an under-

statement. The unusual appearance of words on a CRT is the most unsettling experience for many a new micro user.

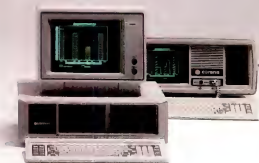
Brodkey says, "I don't find that thinking at the machine is possible. It's more like performing." The nature of the screen display "destroys the essence of ownership with an odd kind of mechanical distancing." Worse yet, he says, "I still can't read off the screen—those little flickers of fire are not prose. And if, as I do, you write long sentences of 50 or 60 words, it takes a certain kind of eye control to read them that you can only manage if they are on paper." Even the meaning changes. "A sentence in print is a lot tighter and has a slightly tougher core than one on the screen. After all, a sentence will look different each time you reread it, and different if it is printed on white or on black paper," says Brodkey.

He concedes that "a lot of sentences on the screen look quite good" in their twinkling perfection. But "scrolling is different from reading—the context is different," he says, and the welter of pixels "blurs my idea of a paragraph." In sum, says Brodkey, "the interplay between me and the language takes place at a higher level on paper."

Howard says she finds that "paragraphs look shorter on the screen," and that her style may be changing accordingly. "I used to think that a sentence of more than four lines, or a paragraph more than 12, was too long. Now I'm not so sure." It's a familiar and understandable syndrome: An 80-character line on the CRT will make paragraphs appear shorter than they do on the narrower margins of a printed page; and the word-wrap facility, which eliminates the need to wobble the carriage return every eight or ten words, doubtless encourages longer sentences.

Many editors believe that computer composition tends to produce wandering structures and general word-bloat. "The computer is not as much of a miracle as some people like to think," says Gypsy da Silva, director of copy editing for the Putnam Publishing Group. "It often stops

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CIRCLE 215 ON READER SERVICE CARD

writers from pondering, from thinking about what they're doing. It's awfully easy to generate a script that looks clean on a word processor." She also feels that too many writers tell themselves, "Well, it's so easy to type my manuscript that it might as well be 900 pages instead of the 450 my editor wants."

Stang agrees. "It's harder to see the flow in a long document than it is with a stack of pages, where you can flip through and perceive it," he says. "Besides, you don't even get to see a whole page at once. And eventually all the paragraphs look the same." Most writers agree that scrolling through a document makes abnormally onerous demands on memory, and that the spectacle of the screen melting and reforming has a mesmerizing effect that weakens concentration. In addition, Stang says, the phosphorescent uniformity of lines on the CRT can't cue the memory the way paper can: "Each individual page may have acquired some other qualities that allow you to identify it—coffee rings, phone numbers scribbled in the corner, and so forth."

The Paper Habit

So strong is the paper habit, in fact, that even the most zealous PC partisans find they can't work entirely without it. Isaac Asimov, the monstrously prolific science fiction veteran, got started on a Radio Shack computer 4 years ago because, he says, "someone gave it to me."

"Now, all my short pieces—of ten pages or less—I do on the word processor directly. All the long pieces, and the books especially, I do on the typewriter." For hefty projects, Asimov says, "I want that paper—the ability to go thumbing through the sheaves."

The lack of paper proved one of Stang's greatest obstacles in getting started. "Because I'm a psychologist," he says, "I'm a big believer in self-reward, and when writing by hand I could watch the stacks of yellow paper grow. But now, the microcomputer swallows it all," and he finds himself making occasional print-

outs for mere reassurance.

Asimov's comprehension suffers if he has to change disks all the time. "It's not the same as having a 6-inch-high pile of paper to refer to." So he does his first drafts in typescript, then transfers them to the computer for light rewriting and editing. "The result is a cleaner copy by far—and a greater willingness on my part to revise because it's so easy."

Fallows says, "I still do my editing with a pen on a typescript. I don't like reading from a screen: I don't have as much of a sense of the movement of the piece." Howard concurs: "I always see something more when I get a printout. You look at it differently, and things just shriek out at you from the page." McIlvain adds that, for some reason, there are "a lot of things I don't perceive on the screen," especially spelling errors, typos, and transposed letters.

"It's just the opposite with me," says Asimov. "Whereas I hesitate to change a perfect printed page with ink corrections, I'm much more inclined to edit on the screen. In that sense, my writing may improve. But then, I make very few changes anyway."

Hooked on the System

Many authors say their ability to focus on the material is further imperiled by the software itself. Some powerful programs offer such a roster of options that writers become hypnotized or addicted to the embellishments—to the disorientation of publishing professionals like da Silva. Next to dot matrix copy, which makes copy editors first dotty, then blind," da Silva says, it's her principal complaint. Right justification, she wrote in a recent memo to editors, "is achieved by fudging the space between words, which only makes doing a character count more difficult. Who needs it?" Not to mention italics, "that phony double-strike boldface," and the rest: "Just tell your author to forget the fancy stuff," she says.

It's not that easy. When Stang was starting out on *WordStar*, "I was easily

distracted by the visual thrill on the screen. I'd get caught up in the formatting and in fooling with margin width, page breaks, headers and end-of-paragraph widows," he says, and wasted many hours. Finally, he switched to Emerging Technologies' *EDIX + WORDIX*, "and my problems were over. Since with these programs, what you see is not what you get, the thrill was gone."

Asimov, by contrast, was determined from the start to prevent such diversions. So, he says, "I learned only the minimum amount of manipulation on my word processor," and he obstinately refuses to learn more—for example, how to repaginate. So now, when he adds a line to a page, he has to take another out somewhere. But at least, he says, "I didn't have to think about it. My fingers have learned all the motions." He's aware that many word processing applications have automatic repagination; and if someone gives him a new system to review, maybe he'll try it. "Until then, I probably won't change."

Bucking the Trend

In general, editors agree that the PC blitz has not yet had a discernible effect on the quality of writing. But they are clearly divided over its potential advantages. Phyllis Grann, editor-in-chief at Putnam, is leery of the phenomenon. "It's an inconvenience in editing," she says. Because each revised version of the manuscript comes out perfectly clean, "you can't tell what's been changed." Michael Korda, senior editor at Simon & Schuster, Inc., agrees. Without conspicuous hand-done corrections, he says, "you have to read the whole book again to see the changes." Although he has used micros himself, and is "not resisting" the trend, he feels that "for book-publishing purposes, electronic editing only makes sense down the road as a way for a secretary to type a manuscript."

Gordon Lish, author and editor at Alfred A. Knopf, Inc., and a recent convert to a Kaypro, has found that the ben-

efits of the computer depend entirely on the author's age ("generational questions are very important here") and method of attack. As for the allure of the ever-changeable screen, "for certain kinds of writers, that kind of freedom is a liability, a danger," he says.

One of those writers is Washington author Bob Reiss. While he was completing his last novel, *The Casco Deception* (Little, Brown & Co., 1982), numerous friends with PCs kept pestering him to get one. "They said, 'Things'll go a lot faster!' But I don't want to go faster. Eighty percent of writing is thinking, and you can't rush that." He is one of many traditionalist hold-outs, among which are novelists Kurt Vonnegut, Bernard Malamud ("It was Edmund Wilson who said, 'I think with my right hand.' Me too."), and, perhaps inevitably, George Will: "I write in longhand, with a fountain pen, of course. I do so not as a political state-

aid, Stephen King, and Peter Straub (the latter two are connected by modern to write a joint novel); and such sundry luminaries as photographer Ansel Adams, Douglas Hofstadter (author of *Godel, Escher, Bach*), and Alvin Toffler (author of *Future Shock*).

The Binary Book

Many publishers are literally banking on a digital future. Among the bullish is William Strachan, senior editor at Viking Press, who lately received the forthcoming *The Day After World War III* by Ed Zuckerman, a breakthrough computerized success for the house. "Ed delivered us a hard copy of the book," says Strachan, "which was edited, copy edited, and sent back to him" along with a list of the compositor's codes for text elements such as chapter headings, subheads, font selection, and size. "He returned to us two floppy disks that contained all the com-


Carol Risher of the Association of American Publishers's Electronic Manuscript Project, "although it may keep them from going up faster." In the transition to disks, she says, "some costs go down, but others go up. You don't have to proofread and retype, but you do have to go through an electronic conversion and the process requires more highly skilled people to put the data in."

Nonetheless, the EMP task force has been working since 1982 with Aspen Software Systems to devise a system-independent generic code for submission of manuscripts that would produce the same results in any typesetter, whether the file was written with *WordStar* under PC-DOS or with *Perfectwriter* under CP/M. The final result—which may be a published set of codes or a piece of software—is due in the summer of 1985. In the interim, the AAP has published *An Author's Primer to Word Processing* (1983), listing a sample set of mnemonic formatting codes that can be inserted into the text like ordinary printer controls: [h1] for a first-level head, [cn] for a chapter number, and [unl] for an unnumbered list.

If the system becomes universal, publishers stand to gain much more than a few bucks saved in typesetting. Once most books also exist in electronic form, they can be added to a library database; and the format coding will enable researchers to identify not only whole volumes but separate sections, just as individual newspaper stories are accessible now. "For publishers, electronic editing creates a whole new market," Risher explains. "They can sell separate chapters to researchers who would never buy the whole book."

When money talks, writers listen. "Many book authors are now asking for their advances in word processing equipment," Risher says. "They're saying, 'Buy me a computer and I'll make it worth your while.'"

Curt Supplee is a feature writer at The Washington Post. He has been using word processing systems for 7 years.



editors agree that the PC blitz has not yet had a discernible effect on the quality of writing.

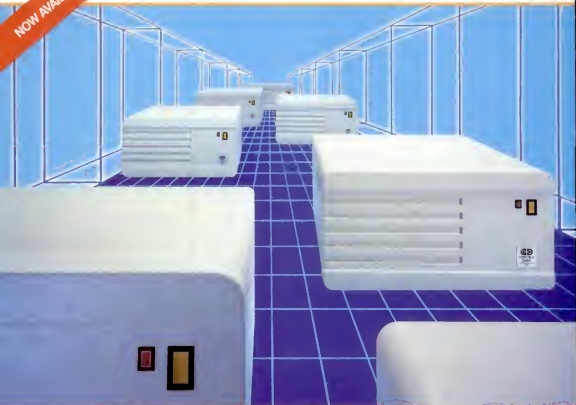
ment—although a Tory could hardly do otherwise—but because writing should be a tactile pleasure. You should feel sentences taking shape. People who use word processors should not be surprised if what they write is to prose as processed cheese is to real cheese."

But that's becoming a minority opinion as so many people with well-known bylines gravitate to microcomputers—including former President Jimmy Carter, novelists Andrew Greeley, Richard Condon, Michael Crichton, John D. MacDonald,

mands and we sent those disks to the compositor. The next hard copy we saw was the galley." The publisher's total estimated savings was 19 percent of composition costs. And since Zuckerman, in effect, did work customarily performed by Viking's in-house staff, Strachan says, "we ought to figure out some sort of compensation." He says he suspects that such remuneration will end up as part of authors' standard contracts.

Unhappily, "the change is not going to mean a thing for the price of books," says

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IN GOOD FORM

page letters, already arranged with single-spaced indented paragraphs. A soft-covered 8½-x-11-inch looseleaf binder holds a printout of each letter on crisp, parchment-like paper and includes a table of

The underlying philosophy of refusals seems to be to pass the buck on to someone else—genuine corporate jellyfishness.

contents with a one-line summary of each letter.

The entire *Gold Letters* set is divided into 13 general classes, such as collections letters (seven variations, plus an apology for when you're too quick on the draw), media letters (thanks for the coverage), memoranda (telephone abuse, lateness policy), personal matters (congratulations and condolences), and special situations and customer relations (apology for an

employee run amok). Finding the letter you need is quick and painless.

At first *Gold Letters* seems like a good idea and well thought out. Pull out the single disk that holds the entire set and start to work with them, however, and you may find shortcomings in both style and content.

You'll run into minor annoyances. For instance, each of the form letters begins with a block that reads as follows:

(YOUR COMPANY'S ADDRESS)
(APPROPRIATE DATE)

You might consider these headings to be welcome reminders; more likely you'll find it a bother to erase them as you work on letter after letter. Each master letter also includes an inside address block, labelled similarly and requiring similar extermination.

Each letter is in a separate file, but every file has the same name (PG); only the extensions vary. That quirk makes the letters easy to select and remember (just select "page" 16), but also means that the only backup copy many word processors will keep is of the latest letter you've edited. Changing file names to use the *Gold Letters* collection with word proces-

sors, such as *EasyWriter*, that require a specific extension becomes a tedious, one-file-at-a-time affair.

A major problem is the supposed catholic nature of this limited selection of letters. Don't think for a minute that *Gold Letters* is an all-inclusive, all-purpose selection. Except for collections, you get just one request, compliment, or excuse per correspondent. If you start dealing out a large stack of "we can't pay this month because of unforeseen circumstances" letters, you can be sure that it won't take long before your creditors start to doubt your sincerity.

Corporate Jellyfishness

The entire collection seems written by a common pen, and the letters share an undercurrent of polite forcefulness, with an emphasis on courtesy. The underlying philosophy of refusals, for instance, seems to be to pass the buck on to someone else—genuine corporate jellyfishness. If that style matches your corporate methodology, you're in luck.

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little spleen or who wants to stop those damned civic groups from eternally begging for charity. Reading through *Gold Letters*, one longs for a good "I'd never give a farthing to your dubious charity because your board of directors is a bunch of crooks and scalliwags, and your fund-raising scheme is a complete sham." A few notes like that will keep the litter out of your in-basket for a long time.

The Gold Writer

Although the *Gold Letters* manual mentions that its letter supply is to be used in conjunction with your word processor, even mentioning *WordStar* by name, you might encounter problems trying to do so. *Gold Letters'* on-disk files may prove as incompatible with your text processor as they did with mine—which is, coincidentally, *WordStar*. The strict ASCII code used by *Gold Letters* drops a solid line feed/carriage return at the end of each line, which hits *WordStar* with enough finality to guarantee that reformatting each paragraph will test your patience. Each "hard" carriage return must be manually removed before *WordStar* will make long and short lines more uniform. Insert Constantine Theodocious Gromompolopolous into the tiny blank marked (name), and your right margin exits the screen. Press "B" to reformat, and surprise! You now have a short, stubby line stuck in the middle of two full length ones. Eye pleasing? No. And it's altogether obvious what you've done.

When I tried *Gold Letters* with an official IBM word processor (*EasyWriter*), the results proved even less rewarding—the processor read the letter as one long line.

The space provided for names and other insertions in *Gold Letters* is the right length for inclusions of normal length, so in most circumstances reformatting may prove unnecessary, and even a primitive text editor may prove workable. But not being able to reformat the letters smoothly forecloses the possibility of making changes or additions to the letter when a

creative spark ignites a new idea.

The only true solution is to look for an alternate word processor that uses standard ASCII files. If you'd rather keep your

Gold Writer is a primitive text editor with the distinction of being as close to a WordStar clone as you can come in compiled BASIC.

favorite and switch files, you can write a little program to remove all the hard carriage returns from the letters. This may be a bother, but it's not impossible.

Embracing a new word processor might not be such a bad idea, particularly since *Gold Letters* comes with its own, called *Gold Writer* in the accompanying documentation and *Ready Writer* on your monitor screen when it starts running. You can invoke it simply by typing RW. Though no instructions for its use are given on paper, two self-tutoring files are included on the *Gold Letters* disk.

In truth, *Gold Writer* is a primitive text editor with the distinction of being as close to a *WordStar* clone as you can come in compiled BASIC (at least that's the language it appears to be written in). Gone from its command repertoire, however, are the *WordStar* extras—menus and on-line help—that most writers never use after the first few weeks of keystroking. Gone, too, are more important *WordStar* features like a directory listing when you're at the "not editing" stage and most printer commands. Nevertheless, all the cursor movement and text manipulating commands remain the same, though they work a bit differently than a *WordStar* addict might expect. Lines scroll slowly, and leaping forward or behind a page with "C" or "R" merely causes a continuous and somewhat

more rapid scroll. Reach the 80-column limit of the on-screen display, and rather than scrolling the screen rightward, *Gold Writer* wraps the line down on the display (but not in printing). As you scroll across several lines, the cursor has a tendency to change intensity, from highlighted to dim and back again. It's a bit slow and somewhat mystical, but like the program it emulates, *Gold Writer* is amazingly versatile and may well prove to be all the text processor that you need. In fact, the files it creates are more ASCII-compatible than those made by *WordStar* because *Gold Writer* does not alter the computer code of last character of every word. Then again, *Gold Writer* won't right-justify text, either.

Letterform 1000

Compared with *Gold Letters* for volume of raw material, *Letterform 1000* wins hands down. The name says it: the package has over 1,000 prefabricated business letters for every occasion.

These letters are not creations carved by craftsmen and scholars in ivory halls. No, this is a collection of actual business correspondence that at one time or another has graced someone's desk.

Pore through the IBM documentation-sized binder that contains a reduced-size hard copy of each letter and form, and you'll see that *Letterform 1000* is as specific as *Gold Letters* is general. There is a letter to introduce a biological laboratory to new doctors in the area, to request the signing of a release form following a fall in a restaurant, to pitch an ad agency to a new client, and to solicit an air-conditioning inspection.

More than just letters, however, *Letterform 1000* also contains business and legal forms, from a quitclaim deed to power of attorney. The contents of the five disks included in the package even include notes that wander far from the business realm. (I found one that just about thanks Gramma and Grampa for the horse, suitable for filling the correspondence needs of any 5-year-old with a PC.)

As the work of real people, many of these letters have real charm of the kind that earns a D-minus in English or a return telephone call from the recipient as he tries to fathom what the letter really means. Most of the letters are mediocre, which means they smack of genuine business correspondence.

Aside from style, the contents of *Letterform 1000* is suspect in the legal forms department. As with any legal form, there lurks in each a chance that what you think it means and its legal effect might be entirely at odds. The manual does whisper a small admonition at the bottom of each page to warn that you should consult an attorney before using the forms within. (Of course, if you should need to consult an attorney, the question arises of why you should bother using the forms at all.) There's also a hint that an attorney might find some of the forms useful, but anyone familiar with the breadth of a genuine book of legal forms would find *Letterform 1000*'s selection a paltry one indeed.

The biggest fault of this collection is its lack of organization and guidance. Although the letters are divided into eight large classes (accounting and collection; employers and employees; general business; goodwill and sales; legal; ordering and shipping; personal; and schools, charities, and organizations), from there on it's a wild goose chase. Although evenly divided, those eight classes have 125 letters and forms each, a number exceeding the contents of the entire well-organized *Gold Letters* compilation. With *Letterform 1000* you must read through nearly every letter in the section of interest to find one that even approaches the situation you need to address.

The search may take longer than it would to compose a personal reply, particularly if your literary style leans toward that of Calvin Coolidge. A simple "Are you crazy?" in reply to a business proposition may be as effective as any prefabricated letter.

The contents of *Letterform 1000* may be its greatest strength, however. Reading

through the manual offers the same sort of entertainment won from watching television soap operas. There are a thousand and one stories in these letters, some of joy,

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many more of disappointment and frustration. The failing business. Estranged relations. Love lost. A generous hand offering credit. Reconciliation and repatriation. Rather than review this package, I was tempted to bid on the movie rights.

The version of *Letterform 1000* I used was designed to run under DOS 1.1, which proved to be a bit cumbersome. The older version of DOS puts severe restrictions on the number of files allowed per disk, so *Letterform 1000* stuffs several letters or forms into each file. The DOS 2.0 version claims to use subdirectories and give each form a home of its own.

Like *Gold Letters*, *Letterform 1000* is supposed to be used in conjunction with your word processor. The individual entries do not include useless headings or signatures—just a salutation and text to surround with your stationery. But alas, the *Letterform 1000* text, like that of *Gold Letters*, is written in standard ASCII files, which gives the same *WordStar* reformatting problem mentioned before. Further, after I copied and renamed files and tried calling them under *EasyWriter*, the characters hid invisibly in the editor.

If you plan on working any magic with *Letterform 1000*, you must have access to a file-conversion program for your word processor, or use a word processor that will handle standard ASCII files. Many

do—even lowly EDLIN—and all of them should be able to handle the minimal editing required for either *Letterform 1000* or *Gold Letters*.

A Choice of Style

Overall, *Gold Letters* is written in the popular American business style that hides the truth behind a veil of obscurity. "So and so has left our employ. Join me in wishing him luck in his future endeavors." A little note like that will guarantee gossip for months. "I fired (name) because I caught his hand in the cash drawer" would certainly stifle the rumors.

The *Gold Letters* approach seems to offer temporary relief but does nothing for the underlying condition—it gives aspirin where a more powerful pain reliever is required. But if you want to be vague or ambiguous, *Gold Letters* is worth its weight in verbiage.

Letterform 1000, on the other hand, gives a selection of different approaches. You can find a sweet letter or one that fits a more brusque style, though sorting through them might be a time-consuming tangle. Yet you might get the greatest value by reading through the whole collection. You might find a new variety of approaches that you could take to different situations and circumstances, adapting and borrowing along the way. More than a quick communications tool, *Letterform 1000* might prove to be an educational—and at times entertaining—experience.

Letterform 1000 seems more like a desk reference, with the side-benefit of saving some keystrokes now and again. Like a secretarial reference book, its manual includes a section on forms of address, a listing of common abbreviations, a punctuation guide, and conversion tables.

Perhaps both of these packages would be best regarded as reference tools to help you find your own way. One of the forms might suit your needs now and then, but reading through the work of others might cause you to think about what you're saying. However you use them, you'll find some value in both collections. ■

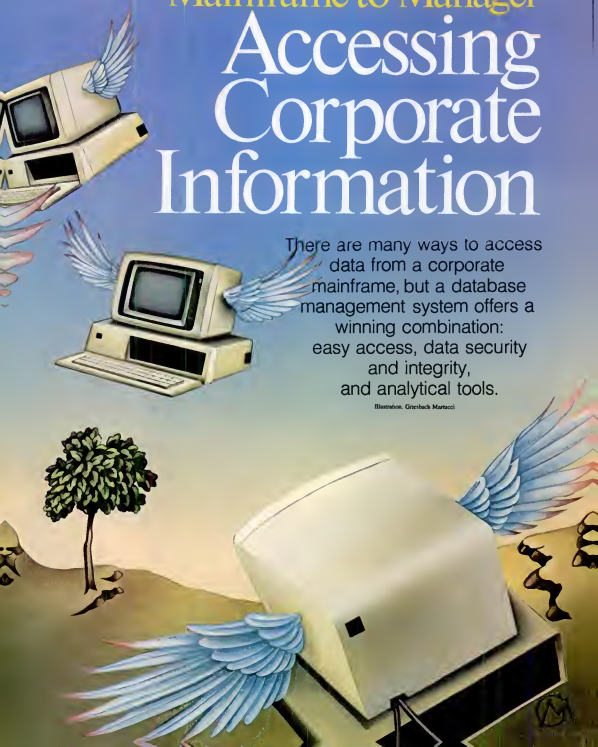
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Mainframe to Manager Accessing Corporate Information

There are many ways to access data from a corporate mainframe, but a database management system offers a winning combination: easy access, data security and integrity, and analytical tools.

Illustration: Griesbach Martucci



CORPORATE ACCESS

In large part, the appeal of the IBM PC in corporate America is that it puts computing power in the hands of managers who have not been well served by the organizations' computer centers. Many business people buy micros with the expectation that they will be able to access and use corporate data stored on a mainframe computer. Often, however, the ease with which the hardware link between corporate mainframes and managers' micros is accomplished belies the considerable obstructions that remain.

Integrating PCs into large organizations generally involves four steps: accessing corporate data maintained in a batch or on-line environment; selecting relevant data from the production file and outputting it to a smaller file; transferring the small file to the micro; and using the data as part of a micro-based application, such

as *SuperCalc* or *WordStar*.

This "distributed processing" approach is probably inevitable in large organizations where the demand for com-

The DBMS strategy is by far the best way to achieve microcomputer access to corporate data.

puting exceeds the capacity of any single mainframe system.

But with the incompatibilities that exist between the mainframe and microcomputer environments, the seemingly simple

task of accessing corporate data usually involves heavy-duty programming that is beyond the capabilities of most managerial users. The managers may insist that it be done by the DP programmers—exactly what the DP center was hoping to avoid.

File Structure Problems

The mainframe environment is largely a COBOL environment. Because it's a good language for file processing, more than 80 percent of business applications are written in COBOL. COBOL programs contain specifications for file structure and record structure that serve as a roadmap enabling the user to locate information in the file. Without these specifications, the sheer size of most corporate files makes them impenetrable or unusable. Thus, the "roadmap" hidden within COBOL pro-

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CORPORATE ACCESS

grams is a major obstacle for managers who are not familiar with the language.

Certain applications are best accomplished in batch mode using sequential access files; the biweekly payroll update is a good example of batch processing. For applications that require continuous updating of data, an on-line approach is used—the IBM VSAM files, which are direct or random access files, are most often used in the on-line environment.

We will look at the problems connected with both sequential and direct access files, with both batch and on-line environments. Rather than forcing ourselves to confront COBOL, simple BASIC terms will be used in the explanations.

Accessing Sequential Files

Let's say the boss asked us to do a salary analysis, comparing the salaries in our

department with those in three similar departments in the organization. The corporate data on salaries is found in the payroll file. DP created a copy of the file for us to work with, so we can work off-line without endangering the payroll master file. The access to the data in this example was easy, but now that we have the file,

what do we have? With 5,000 people or more on the payroll and 40 to 60 fields of data on each person, the payroll file could contain millions of bytes. And we have to locate the employees from six departments. A simple 10-record sequential file with 10 fields might look like the one shown in Figure 1a. Without a roadmap of

PAYROLL DATA FILE									
"100-10-1111"	"LAGRAFF, JENNIFER"	45	12.5	45	1000	250	45	1.5	703.5
"200-22-2345"	"MERCER, MICHELLE"	40	10.5	45	840	210	37	8	1.26
"000-00-0000"	"PETROCINO, MIKE"	20	5.6	45	440	112	20	16	.67
"777-77-7777"	"PERDITI, ERIK"	2	3.4	45	272	68	12	24	.400
"333-33-3333"	"DUPPLER, NORMAN"	16	5.95	45	476	119	21	42	.714
"000-00-0000"	"REMONKO, SARA"	31	9.8	45	794	196	35	28	1.176
"345-50-6789"	"PLATT, PEGGY"	70	20	22	1600	400	72	2	4
"907-65-4321"	"STINSON, JOHN"	11	3.4	22	272	68	12	24	.400
"342-50-7890"	"DAY, JOHN A."	23	9.8	22	784	196	35	28	1.176
"689-43-1234"	"MCCLANAHAN, ANNE H."	31	11	22	800	220	39	6	1.32

Figure 1a: A 10-record sequential file. Each record contains 10 fields of data.

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- Key fields may be string, integer, single or double precision numeric
- Output files may consist of full records, key with record pointer, and record pointer only
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the record structure, sequential data files are impentable. Their usefulness as sources of information depends on our ability to make sense out of the structure.

The PC's async connection, a modem, and communications software are the tickets for moving unformatted data to and fro.

Unfortunately, the vast majority of managerial micro users don't know how to decipher and use the record structure of such a file. They will need help from the DP programmers.

But the task is not impossible. We want to sort by departmental code, which is the fifth field in this file structure. In BASIC, fields in sequential data files are separated by commas; no such luck with COBOL. In the mainframe environment, the task of sorting records by departments would be accomplished with COBOL's SORT command or with a Sort utility, a program so

often used that it is a library file available to programmers. And while DOS 2.0 has both a FIND command and a SORT command, SORT requires that each field be a fixed length, and FIND works only with strings. Therefore, to select people from our department, we might use a BASIC program like the one shown in Figure 1b to create the departmental file shown in Figure 1c.

The file is still an unformatted mess, but we have managed to select the records we wanted. Getting the file from the mainframe to the micro is easily accomplished with many of the communications programs available for the PC. The PC's async connection, a modem, and communications software are the tickets for moving unformatted data to and fro.

The formatting can be easily handled on the micro by using the global commands in a screen editor or with a small BASIC program. An even easier way is provided by Sorcim's Superdata Interchange program, which is included with *SuperCalc*. This program converts comma-separated files to *SuperCalc* files. Each field appears in a separate column, ready for formatting. After formatting, the user can work with the data in a micro's program. Thus, we have accomplished all four steps with a sequential file.

(continued)

```
10 CLS
20 OPEN "I", #1, "PAYROLL.DAT"
30 OPEN "O", #2, "OURDEPT.DAT"
35 IF EOF(1) = -1 THEN 100
45 INPUT #1, SS#, N#, JOB#, PR#, DPT#, PAY#, FTAX#, STAX#, CTAX#, NET#
50 IF DPT# = 22 THEN 55 ELSE 35
55 WRITE #2, N#, JOB#, PR#, DPT#, PAY#, FTAX#, STAX#, CTAX#, NET#
60 GOTO 35
100 CLOSE #1: CLOSE #2
```

Figure 1b: A BASIC program to extract one department's records from the 10-record sequential file in Figure 1a.

```
"PLATT, PEGGY",70,20,22,1600,400,72,2.4,1125.6
"STINSON, JOHN",11,3.4,22,272.68,12.24,.400,191.352
"DAY, JOHN A.",23,9.8,22,784,196.35,28,1.176,551.544
"MCCLANAHAN, ANNE H.",31,11.22,880,220,39.6,1.32,619.88
```

Figure 1c: The OURDEPT.DAT file created using the program shown in Figure 1b.

On-Line Files

An on-line system is advantageous when information needs to be continuously accessed or updated by users. Airlines use very sophisticated on-line systems to handle passenger reservations. On-line users typically work with a preprogrammed screen or view of the data; they are prompted for information, and their input

Owning data brings with it the responsibility for maintaining it and ensuring its accuracy. Little wonder, then, that the owner hesitates to share it.

is checked for validity. In other words, the on-line environment is one in which multiple users simultaneously access and update shared information. Since an on-line system is often the informational heart of an organization, it is generally well protected against user errors. No way will the DP people let us write a little BASIC program to pull off data; if that were possible, we could bring down the system. Most big on-line systems are now using IBM mainframes and IBM's VSAM files. One of the nicest features of VSAM is its ability to index more than one field—for example, SOCIAL SECURITY NUMBER and NAME. Let's use a university example this time and describe an attempt to retrieve the school records of students majoring in management from an on-line student database.

Normally, students' advisors can type in either a student's name or social security number to access a student's record. When the number is plugged in, the record appears on the screen, all nicely format-

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ted, describing the courses and grades for that student. That "read" is the typical access for on-line systems. But we are not interested in a record-by-record access; we want a certain set of records. Managers usually wish to select specific records from a large database, summarize them, and analyze the results. The chairman of the management department, for example, may want to use his PC to analyze the progress of the undergraduate management majors. Since MAJOR is not a key field (that is, one which VSAM has an INDEX to convert to record numbers) we might as well give up on trying to select records in the on-line environment. Instead, we have to get a copy of the file from the DP department.

Direct or random on-line files usually use fixed-length records; the length of each field has to be specified, and the record length is the sum of the fields. There are no carriage returns at the end of each record. As a result, the data appears to be unformatted because each record runs into the next. The student data file we receive from DP is a complete mess, like the portion shown in Figure 2. This unformatted data is, to the computer, one long record.

Even if we know the record structure, the task of extracting specific records requires serious programming. To be successful here, we assumed that we could work with a copy of the file off-line and write a sequential file sort to create a smaller semi-formatted file to work with. Unfortunately, it is unlikely that most of us will successfully extract data from VSAM files.

When one attempts to access on-line files, a problem arises owing to program data dependence. Each COBOL program creates its own data. The major user of the program is often the data's owner; the payroll department, for example, owns payroll data. Owning a set of information brings with it the responsibility for maintaining it and ensuring its accuracy. Little wonder, then, that the owner hesitates to share it with others.

Information Fragmentation

From an organizational point of view, microcomputers are analogous to separate libraries. If one of us uses *SuperCalc*, another prefers *Lotus' 1-2-3*, and still another likes *Multiplan*, we can't share the data we use with these packages. If one of us buys an IBM PC, another an Apple Lisa, and the third a Tandy 2000, none of the programs for one machine will run on another. It would be impossible, for example, to plan, coordinate, and implement the marketing of a new product using



unlike microcomputers or software. Centralization of information in the computer center brought with it the advantages of data integrity and security while providing a means by which information could readily be shared.

Security and integrity are major organizational problems with microcomputers. After extracting data from the corporate mainframe for use on a micro, integrity becomes a problem because of the timeliness of the data, especially with an on-line system. As on-line information is up-

dated, the information being used on the microcomputer quickly becomes out of date. This may lead to a situation in which managers are inferring different conclusions from different information. The only official count on anything remains on the on-line system.

As organizations attempt to "grow" their managerial information systems, many of them come to realize that data fragmentation is a major barrier. Program/data dependence is the source of much of the problem—each COBOL program defines and creates its own data, thereby preventing managers from using it and forcing them to work with redundant copies. This fragmentation becomes the barrier preventing higher-level applications from being built on lower-level applications. The inability to spin off a personnel system from the payroll system frustrates thousands of organizations.

Every commercial applications package requires an additional set of data that must be maintained. It is not surprising, then, that DP centers spend more than 70 percent of their time maintaining this redundant data. The best way for micro users to access a corporation's mainframe would be to achieve program/data independence.

A Better Way

Sadly, lots of computers in an organization means lots of conflicting information. Integration means that the organization maintains one source of up-to-date data, which is shared by appropriate users. The common integrated data is stored in a database. The means to access and use the database is a database management system (DBMS). The DBMS strategy is by far the

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Figure 2: A portion of a VSAM student record file.

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- ☐ A. Direct from manufacturer ☐ System house
☐ B. Manufacturers representative ☐ In-house (company) store
☐ C. Distributor ☐ D. Other (please specify)
☐ D. Retail computer store

9. Please indicate below the communications capability for which these Personal (Micro) Computers are used.

- ☐ A. Communicate with remote timesharing or database
☐ B. Communicate with internal mainframe or minicomputer
☐ C. Used in local area network
☐ D. Down load data from mainframe or remote service
☐ E. None of the above

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- ☐ 1 Accounting ☐ 9 Graphics Design
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☐ 7 Entertainment/Games
☐ 8 Financial Planning

10. Do you help acquire, recommend, specify or approve any of the products or services below?

- ☐ Yes (If yes, please check all that apply)
☐ No.

Computers

- ☐ 1 Mainframe
☐ 2 Minicomputer
☐ 3 Personal (Micro)

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☐ 8 Graphics Printer
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24 Payroll

- ☐ 25 Time Billing
☐ 26 Financial Planners/Spreadsheet
☐ 27 Project Managers
☐ 28 Word Processors
☐ 29 Compilers
☐ 30 Database Managers
☐ 31 Program Developers/Generator Tools
☐ 32 Business Graphics
☐ 33 Maintenance
☐ 34 Education/Training
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☐ 36 Remote Computing
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☐ 42 Forms & Other Consumables

11. Are there any other individuals at this location that would qualify for a complimentary subscription to PC WEEK?

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2. ☐ No, I do not want to receive PC WEEK.

3. Primary business activity of your firm at this location (check one only).

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☐ 2 Manufacturing other
☐ 3 Agriculture, mining, construction
☐ 4 Transportation
☐ 5 Communications
☐ 6 Utilities
☐ 7 Computer related retailer
☐ 8 Non-computer related retailer or wholesaler
☐ 9 Finance, banking, insurance, real estate
☐ 10 Health, medical service
☐ 11 Legal
☐ 12 Education
☐ 13 Data processing, computer service
☐ 14 Other business services
☐ 15 Government
☐ 16 Consultant
☐ 17 Other (please specify)

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☐ 25 Design/Production/Research Engineer
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☐ 27 Educator
☐ 28 Other (please be specific)

5. Do you have any MAINFRAME computers or MINICOMPUTERS on site at this location?

- ☐ Yes (If yes, please report accurately below for the two largest.)
☐ No

Manufacturer	Model	Quantity

IBM or Compatible Personal (Micro) Computer Information for this location:

(Please report accurately for each model indicated)

Manufacturer's Name, Model	6. Currently Owned (Quantity)	7. Plan To Purchase Within	8. 0-12 Months (Quantity)	9. 13-24 Months (Quantity)	10. 25-36 Months (Quantity)
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IBM PC XT					
IBM XT/370					
IBM PC/3270					
IBM PCjr					
IBM Compatibles (Compaq, Eagle, etc.)					
Other (Not IBM or Compatibles)					

7a. In which of the following ways are you yourself involved with these Personal (Micro) Computers at your location?

- ☐ A. Use them ☐ F. Other Involvement (specify)
☐ B. Recommend them
☐ C. Establish specifications
☐ D. Approve purchase ☐ G. No involvement
☐ E. Acquire them

8. The Personal (Micro) Computers purchased for this location would be:

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best way to achieve microcomputer access to corporate data.

The major obstacle to implementing such a system is political; the major data owners must be talked into sharing data with authorized users. Because a DBMS is designed to accommodate the sharing of data, it has exceptionally good security. The owners need not worry that a user can alter their data; only people with permission are permitted to update records. Backup and recovery procedures can be worked out.

The next obstacle is the rigidity of the on-line file structure. PC users are usually unable to select the records they need from a large file, even if it's available off-line. The example we cited was our inability to extract management students' records from the university's student record file. The VSAM file is set up to accommodate

The major obstacle to implementing a DMBS strategy is political. The major data owners must be talked into sharing data with users.

access by Social Security number or by name, but not by department code. As a result, programming is necessary to create a file containing the student records for those students majoring in our depart-

ment. On the other hand, DBMS is designed to eliminate programming.

Our organization, Ohio University, stymied by obstacles to implementing a decentralized system of mainframes, minicomputers, and microcomputers, has decided to convert to a DBMS. The linked IBM 4381-4341 mainframes will run Cincom System's relational DBMS, *77S*; the Business College's DEC VAX 780 minicomputer will run Cincom's *Ultra*; IBM PC's and DEC Rainbows can access either database.

Cincom designed its relational DBMS software to integrate the use of mainframes, minis, and micros. Not only can data files be passed from computer to computer, the IBM 4341 and the DEC VAX can share applications programs. The chairman of the management department, for example, can use his PC as a

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terminal and write an applications program on the mainframe to extract information about management students, move the data file over to the VAX, and then either analyze it within *Ultra* or move it to the PC.

The better relational DBMS products, such as *TIS* and *Ultra*, provide a simple query language for nonprogramming users. The relational features of the DBMS take care of concerns about file structure or file location. An example using a DBMS query language will tell the essential story:

```
IF DEPT = MANAGEMENT,
  SORT BY NAME,
  PRINT NAME
GRADUATION DATE
GPA.
```

How's that for simple? A DBMS really

With DBMS, owners need not worry that a user can alter their data; only people with permission are permitted to update records.

brings the power of the computer to the managerial users; information becomes easily accessible to anyone with the proper authorization.

Good DBMS products also include

powerful tools for analyzing the information extracted from the database. Applications in Cincom's *TIS*, for example, are written in a 4th generation language called Mantis; it is now supplemented by Mancalc and Mangraf. Mancalc is a three-dimensional spreadsheet, Mangraf creates graphs and charts, data extracted from the database can be manipulated and quickly displayed in either a graphic or spreadsheet format. But if the user wants to perform analysis on the PC, the file can easily be shipped to the micro in a format readable by *SuperCalc*.

Conclusion

Many organizations are finding it difficult to build higher-level managerial systems off of the mainframe's lower-level systems. Microcomputers are a way in which managers can build their own sys-

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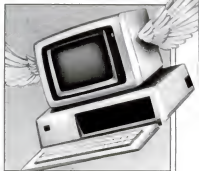
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A good, relational DBMS is the key to the successful integration of mainframe data into distributed microsystems.

terms, but managers need to access and use corporate data. This becomes a source of conflict between the users and the DP center, since DP programmers must write a program to get the data for the managers. The DP people are also rightly concerned about the security and integrity of data.

A good, relational database management system (DBMS) is the key to the successful integration of mainframe data into distributed microcomputer systems. The central database can become the library where corporate information is stored. Information is catalogued and easily located, and the data can be simultaneously shared by multiple users. A DBMS also provides tools with which managers can manipulate and analyze the information. Finally, like the library, the DBMS is designed to help users "check out" information; files can be passed to micro so that the data can be read and analyzed in the user's own location. ■

The Future State of the Art: Computer Sight

The state of computer input art is getting better, but speech recognition technology still has a long way to go. What we need now is a magic wand to give sight to our computers.

Do you ever marvel at how fast you can read? It's quite remarkable, really. The average reader tools along at about 500 words per minute. That's about 3,000 characters per minute, or 50 characters per second. Better readers can attain speeds of 800 to 1,000 words per minute, and speed readers can plow through text at truly astonishing rates.

I admit that by many standards these are not blazing speeds. You'll finish this piece in about 3 minutes, not including the time many of you may take to reread it. However, when you consider how much time it takes to write a piece like this, you may begin to better appreciate your own talent. When I type from handwritten text, I can usually sustain a speed of about 45 words per minute, and occasionally I hit peaks of 75. This rate amounts to only one-tenth of your reading speed. But this is not my typical method of writing. I, like most of my associates, actually write while I sit in front of the computer. Over the past 2 years, I have clocked my on-line writing time at about 500 words per hour—only 1/10 of your reading speed. This slow pace is the result of thinking and revising and revising and thinking and correcting types.

I could potentially write a bit faster than I do. I could dictate the first draft of an article perhaps as fast as 120 words per

minute, which is equivalent to the best speed a skilled stenographer could attain. Actually 90 words per minute might be more realistic. For the sake of it, I'll call it 100; that's 6,000 words per hour.

Computer sight will be more helpful in the short run than any other single form of data interchange.

The speed with which we read may be one of the major frustrations that confronts computer users when they attempt to enter information that takes up more than a page or so. Why? Because compared with all but the most expensive computer data entry technologies (such as page-oriented OCR), reading is extremely fast. Today, the vast majority of data input is still accomplished with the typewriter keyboard, and the QWERTY one to boot—not even the faster Dvorak. Neither keyboard allows the operator to input data at speeds that even approach average human reading speed.

As it turns out, this, in fact, is the next

big technological hurdle, and it is probably the last one for some time. (If we are to believe the science fiction writers, the step beyond that is direct connection to the brain, but presumably that lies quite far in the future.) That speech recognition is being studied or even considered within the realm of possibility is amazing in itself. The question is whether or not such technology is feasible.

Currently, a great deal of work on the dual problems of speech generation and speech recognition is in progress. Of the two, the former is considerably simpler. It is only a matter of time before computers will be able to speak clearly (that is, non-mechanically). They are already capable of reproducing digitally stored speech with a chilling accuracy, as anyone who has a speaking coffee maker that says "Good morning, darling," in a voice of the appropriate gender can attest.

Speech recognition is several orders of magnitude more complicated, and technology has not come too far in this area. Judging the current state of the art it appears that a system can be trained to recognize words and phrases spoken by an individual, but that same system is mystified by a different person speaking the same vocabulary. In fact, the same person's voice on another day or with changes in inflection or tone can confuse

the system. The manner in which we casually chat is nothing more than gibberish to today's recognition systems.

This technology is hardly the stuff of which electronic stenography is made.

Three things are needed to successfully build cost- and performance-effective speech recognition systems: algorithms, performance, and processors. The computer scientists, engineers, and scientists still have a great deal of work to do. In order for a cohesive set of algorithms to evolve, much more has to be learned about speech recognition. These procedures can then be applied to effective, real-world systems. There is no escaping this requirement, and, truthfully, we are not terribly far along.

The next factor is performance. The speech recognition process involves a good bit of digital signal processing, which typically requires a tremendous amount of computing power. The other major piece of work is pattern matching and analysis, which requires even more time than signal processing. To engage in such activities, a computer must be able to perform at extremely high speeds.

This performance requirement mandates both special-purpose processors (designed with instructions for signal processing or pattern matching, for example) and parallel processing. In order to perform work in parallel, multiple processors are probably needed. The number of processors needed might be measured in tens or hundreds, which would make cost a limiting factor. Low-cost, high-speed microprocessors designed specifically for such tasks are an obvious goal.

This goal may sound attainable, and I suppose it is if we ignore the issue of cost. But compared with a complicated, multi-microprocessor system, today's IBM PC is simply a child's toy. It also costs about \$3,000 (ignoring such speech-independent amenities such as displays and printers), and it cannot begin to recognize the human voice. Suppose a 20-MHz 8086 (if one existed) cost \$25 (a low price for a part like this). How many would you need to

make recognition technology feasible? How would the processors be connected, how much power would they require, and what software would control them?

The manner in which we casually chat is nothing more than gibberish to today's recognition systems.

The questions about operating a multi-processor system do not yet have satisfactory answers. In short, today is not the day for everyman's speech recognition, both by virtue of cost and lack of knowledge.

If Computers Could Hear . . .

Even if computers were capable of speech recognition, something would be lacking. If we consider only the language, not the pictures, computers will need the ability to see, too.

Actually, this is something of a breakthrough. In our search for alternative forms of computer input and the ultimate replacement for the keyboard, we would certainly like to avoid mechanical processes like moving fingers. This leads us directly down the path toward computer hearing. But as I've indicated, we haven't made that much progress. Significantly greater progress has been made in the area of optical character recognition, however, and the industry even has (by computer industry standards) a long history. We are much more likely to find short-term solutions that will allow us to have computers read the printed word.

How can the need for computers to see be considered a breakthrough? Take, for example, a program printed in this magazine. Imagine the thousands of readers who key it in and remember typing a program listing is far slower than English language typing. Let's see, thousands of

readers times ten fingers times 3,000 characters in the program is, uh—well, you could light a small city with all that energy. Wouldn't it be nice to wave a wand over the page and have the program sucked right in?

The blind are using devices like this today, although they are designed to either speak the letters or convert them to a tactile sensing device in which the blind person's finger rests. They are quite accurate, can read almost any style of type, and are invaluable reading aids to the sightless. They are also capable of feeding the data directly to a computer.

However, these devices are not without problems. If they miss a letter in a word, the user can often mentally fill the gap. But pattern recognition like this is beyond the capability of the inexpensive desktop computer, so even greater accuracy is required. They are also expensive at the moment, but not so expensive as to make them unreachable if the need for them became apparent. The point is that the technology does exist; it needs refinement. As a beneficial side effect, once these devices were widely available, the price would drop.

If you think about technology like this for a moment, you'll understand its merits. Consider how many times you transfer data from the printed page to the computer. Need a quotation for a paper? Wave the wand over the original! Not sure how to spell antidisestablishmentarianism? Crack your dictionary and wave your wand over it! Do you want to add customer names and addresses to your accounts receivables? Wave a wand over the return address on their envelopes! Plagiarize the *Congressional Record* for your next speech? Take the wand in hand!

I believe computer sight will be more helpful in the short run than any other single form of data interchange. That's not to say we will or should not continue to search for speech-recognition technologies. But reading the printed word (or number) is much closer to reality, and, in its own right, tremendously useful. ■

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The Thrill Is Gone

The arcade favorites Pac-Man, Defender, and Stargate are now available for the PC. But these games are no longer the state-of-the-art and can't match their arcade originators.

There would be no "PC Arcade" had there not been video arcades. And there would not have been arcades—at least as we know them—had there not been arcade games such as *Pac-Man*, *Defender*, *Dig Dug*, and a few others. These Atari programs were among the breakthroughs in video gaming, displacing the mechanical pinball machines and gypsy fortune tellers with row upon row of beeping and flashing electronic devices.

Arcade machines are highly specialized microcomputers; they have tremendous power assigned to video display and animation, and expensive, responsive joysticks and trackballs. Many earlier translations of arcade games to cartridge-based home-video game machines such as the Atari 2600, Mattel's Intellivision or Colecovision, were mere shadows of the real thing. They featured slovenly stick figures and molasseslike response. Now, though, with the advent of more powerful personal

computers like the IBM PC, Atari has released new, disk, versions of many of its all-time favorites. The games require 128K and work best with a joystick.

All the Atari offerings are nicely packaged in similar blue boxes. The instruction sheets inside are competent, but not overly helpful. One problem with the instructions is that all of the boxes I examined listed DOS 2.0 as a requirement. This is incorrect. Each of the copy-protected games

comes with its own operating system, and there is no need for the user to purchase IBM's DOS 2.0 (or 1.1 or 2.1) to use them.

I'll look at three of Atari's new releases for the PC in this column, and come back to others in later issues.

Pac-Man

We must remind ourselves that *Pac-Man* was the start of something big. The

Pac-Man

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PC ARCADE

coin-operated arcade version of this game launched a thousand million quarters, bringing a new character and concept to the American Way of Play.

The concept of *Pac-Man* is rather ordinary. In case you are one of the three living Americans who have not seen the game in action, the scenario goes like this: You are the controller of a round little guy called Pac-Man as he is chased through a maze of dozens of dots. As Pac-Man passes them by, he eats them and scores points. Ah, but there's more: There are also a bunch of unpleasant "goblins" who chase mercilessly after poor Pac-Man. If they catch up with him, they eat him—and laugh. So, Pac-Man's controller tries to maneuver our hero to the corners of the maze where "power pills" reside. Swallow a power pill, and, for eight delicious seconds, Pac-Man is invulnerable chases the goblins.

That's all, folks. The tempo is not all that fast, although the musical accompaniment and sound effects do heighten the sense of chase a little bit. Each maze is only slightly different from the one before, with minor alterations in speed and in the reactions of the goblins.

But there's obviously something addictive about this game, and Atari and hundreds of coin arcade operators across the country went to the bank with many sacks of quarters to prove it.

Since the dimly recalled days of *Pac-Man*'s birth, we've seen the little guy acquire a female companion named *Ms. Pac-Man*, a *Baby Pac-Man*, and a thousand uninspired imitations including snack-men and trap-men and bag ladies. The market has seen poor clones appear in cartridge form for home-video players and laughable and unplayable versions emerge in hand-held throw-away toys.

Now, enter Atari with the "official" version for the IBM PC—the only one that can legally bear the name *Pac-Man*. Well, I've got good news and bad news. The good news is that the PC *Pac-Man* is better than any of its competitors. The bad news is that if you are a *Pac-Man* purist,



In *Defender*, you must save the kidnapped humanoids before they turn into evil mutants.



A screen from *Stargate* showing the scanner, which *Defender* also uses, in the top center.

don't put away your quarters.

The PC *Pac-Man* is nearly identical in design, sound effects, and appearance to the arcade version. However, the play is somewhat sluggish by comparison and occasionally unresponsive to the joystick. The PC version allows you to select the level of maze at which you want to start, and there is a pause and reset control. However, there is no joystick adjustment routine.

In speed and ease of play, *Pac-Man* seems to suffer in comparison with some of the more recent IBM PC arrivals such as *Lode Runner*, which was written specifically for microcomputers, and *J-Bird*, which is a clone of the arcade hit *Q-Bert*. Nevertheless, the daddy of them all has arrived on the PC, and it is probably worth a place in the collection of any serious gamer.

On *PC Magazine*'s rating scale from one to six, Atari's new PC *Pac-Man* gob-

PC ARCADE

bles a respectable:

FUN:	4
CHALLENGE:	4
GRAPHICS/SOUND:	4
TOTAL:	12

Defender

Stargate

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List Price: \$34.95 each

Requires: 128K RAM, color/graphics adapter, color monitor recommended, game adapter and joysticks optional.

CIRCLE 798 ON READER SERVICE CARD

I'm reviewing *Defender* and *Stargate* together because there's not that much difference between them. *Stargate* is an

updated version of *Defender*; it's a little easier to play and adds a few details.

These two games were the prototypes for the moving spaceship shoot-'em-up genre. You control a spaceship that can be moved up or down, left or right, or at any angle across a moving tableau of the surface of an alien land. (In another form of the intergalactic good-guy/bad-guy "game," the firing platform is limited to back-and-forth movement, and the attackers come out to meet you.)

Defender and *Stargate* provide you with three controls in addition to movement; you can fire a laser, you can drop one of a limited number of "smart bombs" that will wipe out all the attackers on the screen, and each game has a "super-device." These super devices are activated by pressing both joystick buttons at the same time. *Defender*'s super device is

a quick jump to hyperspace, which transports you out of the area of immediate danger but into a new combat zone. Pressing both buttons in *Stargate* invokes the "Inviso Anti-Matter Cloaking Shields," which cause your ship to disappear from the screen for a few seconds. You can continue fighting during that time, and anything that hits your ship will blow up.

Desperate Scenarios

Defender's scenario reads: "Help the humanoid race survive. Defender. Armed aliens of all kinds have surrounded our planet. One by one, alien Landers swoop down to snatch up our stunned humanoid race. Only your sophisticated Defender ship can rescue humanoid hostages before they turn into double-crossing Mutants that come back to kill you!"

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PC ARCADE

oids left on the planet. When a humanoid is kidnapped by an alien Lander, you must destroy the Lander immediately and rescue the hostage."

With that in mind, *Stargate's* story will sound pretty familiar: You find yourself in a time of turmoil where aliens fight over humanoids left on the planet. By now, most have been taken hostage. Only you can save the last of the lost humanoid race. Better start looking for *Stargate*.

"Stargate can lead you to the humanoid hostages. And, if you are carrying four or more humanoids, Stargate will warp you ahead several waves, earn you points, and replenish your supply of humanoids."

Not Easy

Neither game is easy—you will probably be killed within the opening seconds the first few times you try to play.

A few nits: Both *Defender* and *Stargate* make selecting between one or two-player games a confusing process. Neither game maintains a permanent record of high scores. And, though both games allow you to choose a starting wave number, there is no indication of what the numbers mean in terms of difficulty of play. Finally, *Defender* does not seem to penalize you for shooting the very humanoids you are supposed to rescue.

I cannot admit to much enthusiasm for either of these games. Like *Pac-Man*, they have been surpassed by newer games with more creativity and value. These two are just another blast from the past.

On PC Magazine's scoring system, they carve out ordinary ratings:

<i>Defender</i>	
FUN:	3
CHALLENGE:	3
SOUND/GRAPHICS:	3
TOTAL:	9

<i>Stargate</i>	
FUN:	3.5
CHALLENGE:	3
SOUND/GRAPHICS:	3
TOTAL:	9.5

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Deciphering The Life of Turing

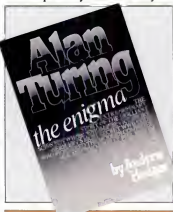
Andrew Hodges' biography examines the life of Alan Turing, the forward-thinking British mathematician who in the 1930s spearheaded research in artificial intelligence and cryptanalysis.

In February, the Fredkin Foundation announced that it will give a \$100,000 award to the first programmer who can create a computer program capable of making a significant mathematical discovery. The mathematicians and computer scientists acting as judges agree that this means the computer must do more than supply some so-far unattained proof; first, the machine has to actually formulate the original theorem it solves. No coaching allowed from the programmer, either.

In creating the award, the Fredkin Foundation is advancing the notion that machines are capable of contributing independently to scientific thought. The idea seems to have achieved respectability at last, 35 years after British mathematician Alan Turing first voiced it and 30 years after his death.

Turing, whose ideas provided the conceptual framework that informed the design of the first computers, probably would have appreciated the irony of this award's establishment occurring simultaneously with the appearance of his biography, *Alan Turing: The Enigma*, by Andrew Hodges. But perhaps "irony" is

too slight a word; "vindication" may be more suitable, since Turing's arguments about the possibility of what we today call



artificial intelligence were phrased even before a programmable computer had been built. But at the time ideas were derided, and his considerable contributions to computing were dismissed out of hand.

Perhaps the pragmatic, informal terms in which Turing presented his arguments crippled their appeal to the scientific community. What he said was we can't really tell that other people are thinking, except by comparison with ourselves, and therefore it's only "fair play" to apply the same

rule to a machine. If a machine's response to a question can't be differentiated from a human's, then, however it manages to come up with that response, we're obliged to call the process "thinking."

Today this down-to-earth test of artificial intelligence is called a Turing test. The elusive measure Turing proposed is far simpler than what the Fredkin Prize judges have set as their standard, yet theirs is implicit in his. Turing insisted that any question be allowed, so the challenge posed by the Fredkin Foundation—"Can you come up with original, significant mathematical work?"—is permissible. Estimates now are that the award will be won in 10 to 20 years, right in line with Turing's own prediction in 1950 that computers would be able to pass the Turing test in 50 years' time.

His Rise and Fall

Alan M. Turing was born June 23, 1912, in Paddington, England, to parents who spent most of their son's childhood in India and France while he was raised and schooled in England. He was an unpopular and dim student, whose native brilliance in math and science was ignited in his last years of preparatory school. He won a scholarship to King's College, Cambridge, where he didn't fit in with the intellectuals or the athletes (though he rowed and ran); didn't find the mathemat-

Alan Turing: The Enigma
Andrew Hodges
(Simon & Schuster, New York)
587 pages; hardcover; \$22.50

BOOK REVIEW

ics faculty inspiring (the lack of appeal was mutual); and couldn't bring himself to approach the study of mathematics in a logical, orderly, disciplined manner.

When he was 23, confirmed in his solitary ways and inventing whatever proofs he needed as he went along, Turing solved one of the great mathematical questions of

the pre-electronic era, Hilbert's so-called *Entscheidungsproblem*. To show that there was not a "mechanical" solution to every mathematical problem, he deduced the minimum requirements of a machine that, given the proper instructions, could solve any problem expressed in symbols. He was finishing work begun by Gödel, and the notion of a "universal Turing machine," which could take over the work of any symbol-solving machine, was an incidental by-product of his proof.

Turing's quirky, sheltered nature could only have survived in the academic harbor King's College provided. There, as Hodges puts it, he was simply another "ordinary English homosexual atheist mathematician." But once outside its protective confines, his unworldliness—his insistence on reaching his own conclusions, ignoring how other people thought, and believing he would be left to his own devices—led inexorably to increasing isolation from his peers, his criminal conviction for being homosexual, and his suicide at age 41.

Turing lacked the charm to succeed in academic politics and the sheer force of personality to impress his original thinking on the tenor of his times. Once made, his contributions became easily disassociated from him. His name has remained quite obscure until recently, yet when we look closely we discover his fingerprints all over matters central to computing and logic. Recursion, artificial intelligence, cryptography, and even the concept of a processor's stack bear his imprint. He was a central figure in the development of the first large electronic machinery, a code-breaking machine built in Britain during World War II. He also contributed to the design of the first working programmable computer, the prototype to the British Mark I. Even in precomputer days, Turing advanced the idea of having a machine test some condition to see whether it should continue a job or move to another task—a forerunner to today's familiar concept of an IF-THEN loop. The preoccupation with chess-playing as proof of a comput-



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BOOK REVIEW

er's intellectual attainments can also be traced, in part, to Turing.

Hodges' Retrospective

Now, in fact, 50 years after his momentous mathematical paper, *On Computable Numbers*, the Turing machine and the Turing test accord Alan Turing a certain recognition denied him in his lifetime (though he was in 1951 named a Fellow of the Royal Society for the work on computable numbers that he had done 15 years before). A biography can only glance at the influence of Turing's contributions to computer science and mathematics, and it can only attempt to understand the sadness of his life. Still, Andrew Hodges—himself a Cambridge mathematician, and not an historian or writer—sets three tasks for himself in examining Turing's life, and he performs them all quite ably.

First, Hodges argues the case for Alan Turing's significance in the history of scientific ideas. This is no small feat, given the abstract nature of Turing's contributions, for Hodges is not arguing before a handful of interested specialists, but to a wider public. This is generally what gives scientific biographies their appeal: The science and the significance of a breakthrough must be explained in terms accessible to the layman. Hodges acquits himself well in this task, for we come to admire Turing's independence, even though it is often manifested, pathetically, as isolation.

Second, to address the personal side of Turing's life, Hodges records all that is known about Turing. He has done a surprisingly thorough job here, given that Turing had no disciples and few friends, caused scarcely a ripple in academic and computing circles, and spent the 6 years of World War II almost incommunicado while working on the war's most carefully kept secret project, the cryptanalysis of Germany's Enigma-machine communications codes. That this book is 587 pages long is a testament to Hodges' thoroughness in accomplishing this task.

The third task is of Hodges' own making, that of describing how Turing's indifference to scientific and social conventions was the key to his scientific breakthroughs and also to his downfall. Turing's achievements could be suitably analyzed and understood without bringing in his homosexuality, but Hodges' case for including it is finally persuasive, since it reflects Turing's virtual compulsion always to make his own way. To omit it would be to leave our understanding of this influential and iconoclastic figure incomplete.

Excerpt: Perhaps the closest evocation of the Turing spirit in this period was not in science, but in science fiction—a cinematic Back to Methuselah. The date of 2001: A Space Odyssey was presumably taken from the fifty-year prophecy in the Mind paper, which was specifically cited in Arthur C. Clarke and Stanley Kubrick's book. Their picture of HAL was essentially based on Turing ideas; and, quite uncannily, their plot had HAL destroyed by "the logic of the planners," whose "twin gods of Security and National Interest meant nothing to HAL. He was only aware of the conflict that was slowly destroying his integrity—the conflict between truth and concealment of truth."

BRIEF REVIEWS

Kids and the IBM PC

Edward H. Carlson
Illustrated by Paul D. Trap
(Datamost, Chatsworth, CA)
238 pages; softcover; \$19.95

Beginners belong in the sure hands of a book like this, no matter their age (and despite its age-demarking title). Carlson's *Kids and the . . .* series, adapted for different microcomputers, adroitly carves BASIC, programming, and diverse computer capabilities into bite-sized, digestible chunks. Seventh-graders make up the target audience, so chapter lengths, language and cartoon-type illustrations are

pitched to that level. But since Carlson never speaks down to his beginning students, older readers will not find themselves chafing at simple-mindedness or tedious pacing.

The book has instructor's notes prefacing each of its 33 chapters, making it well

Carlson's series
carves BASIC and
diverse computer
capabilities into
bite-size,
digestible chunks.

suited for teaching purposes, but the book is in fact even more appropriate for self-instruction, with each reader setting his or her own pace. The first 14 chapters present a "sprint" through BASIC and such operations as how to SAVE to disk. With this arrangement, the elemental pieces are in place quickly, and serious programs can be tackled early on in one's study. For its mixture of instruction, friendly advice, and pedagogical questioning, everything about *Kids and the IBM PC* deserves high marks.

Excerpt: At small scale . . . computing is an almost ideal self-paced learning situation, because syntax errors are largely discovered and pointed out by the BASIC interpreter as the child builds and tests the program.

At larger scales, creativity comes into full scope and many other latent abilities of the child are developed. School skills such as arithmetic and language arts are utilized as needed, and thus strengthened. But the strongest features of programming are balanced between analysis (why doesn't it work as I want) and synthesis (planning on several size scales, from the program as a whole down through loops and subroutines to individual commands).

On the Road: Writing in Transit

If you're a writer with a PC habit and you travel often, you may find it hard to leave your computer at home—and even harder to take it along. Here, one writer struggles with the dilemma.

Taking your PC on the road is not easy—even with IBM's new Portable. If you have both writing and traveling to do, you may have to make some tradeoffs.

That's what I found over the past few months, as I struggled to attend events and meetings yet still meet my deadlines.

When my travel plans and deadlines began to overlap, my first thought was to rely on my trusty yellow pad and pen. Two of the many advantages of this method are compact size and no worries about theft. But too often I found that by the time I got home I had deadlines breathing down my neck, sections of text that even I couldn't read, and vital facts missing. I prefer to start an article while information is fresh and sources are available.

Writing articles and reports longhand didn't seem to work—I've become so accustomed to revising heavily with a word processing program that anything I write without one has to be rewritten when I get home. Psychologically it was impossible to go back to ink-stained fingers and a wastebasket of abandoned drafts.

My next experiment was with a Compaq. (See "A Garden of Portables," *PC*, Volume 3 Number 6.) Once I had arrived and set it up, it was wonderful to have a PC-compatible machine. If I only finished an outline or a rough draft, as was usually the case, I was able to bring the disks home and stick them in my desktop PC.



With all its virtues, I found that a "luggable" machine is a viable solution. Compaq claims its machine is hardy, but I couldn't bring myself to just toss it on buses and check it as normal baggage in airports. And it's too large and heavy to treat gingerly all the time.

I also had trouble figuring out what to do with it during the day. When I'm on the road, I'm usually at a show or meetings during the day, out for dinner, and then back in my room at night trying to write.

At daytime events to which I didn't want to take it, the Compaq seemed vulnerable sitting in the hotel room or in a checkroom during a meeting. Most fancier hotels have vaults for valuables, but not

the more spartan establishments at which I usually stay. And many of those with some kind of check service are set up only to store jewels or other small items.

Overall, I decided, the Compaq works best as an office machine that you could also bring home, not as a tool for the wandering writer. This is equally true for all the sewing machine-sized portables.

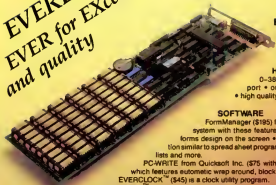
Traveling in Hyperspace

I wasn't ready to give up on compatibles, so I turned to the Anderson-Jacobson Passport, a relabeled version of the Bytec Hyperion. Although the Passport is similar in basic equipment to a Compaq (two IBM-compatible drives, a 7-inch amber screen, and MS-DOS), it's small and light enough to stuff in a medium-large suitcase along with the rest of my travel necessities or to carry packed in its carrying bag as a second piece of luggage.

Although the Passport needs some care, its size puts it in a different league from the Compaq. I had no trouble getting it through doors or up stairs, fitting it in luggage racks or even in my lap.

The Passport comes with a built-in 300-baud direct connect modem that I planned to use to send out stories by electronic mail. Unfortunately, to use the direct connect cable you have to find a modular phone and unplug the wires. Few hotel phones, I found, are modular (probably because hotels don't want guests walking

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AD-105

CIRCLE 154 ON READER SERVICE CARD

off with select pieces). And at companies with non-Bell switchboards, the phones are often permanently wired or use some other connector. Pay phones, naturally,

are made to resist attempts to monkey around with their wiring.

When I did locate a modular phone and connected the modem, I found that if I

didn't have a true grounded three-wire outlet, the modem produced a loud electrical hum during phone calls. Although the modem worked despite the noise, I bought a grounding adapter anyway.

Once you've carried it up to your room and hooked it up, the Passport is a delight. Because the keyboard slips easily into a slot in the bottom of the machine, when not in use the Passport takes up about half as much desk space as a PC and keyboard.

The Passport comes with a bundled word processor and communications package. Although you can boot up PC-DOS, not all PC-DOS programs will run on this machine.

Traveling Light

If I saw my future as a succession of nights in hotel rooms with only a PC-compatible for company, the Passport might be my choice. But on an average trip, I spend more time in airplanes, waiting for connections, between sessions, and listening to speeches at which I'd like to take notes or work on something else.

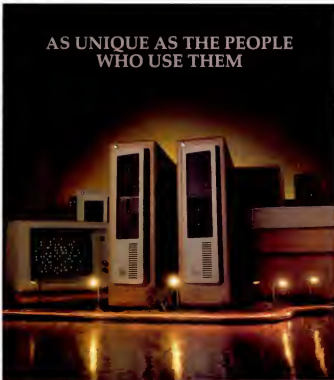
For my next trip, I decided to try a true lap-sized machine. Forgoing direct compatibility, I borrowed a Radio Shack Model 100, instruction book, and cables for telephone connection from a friend. I figured I'd write as much as its memory could hold and send stories back by electronic mail. (See "The TRS-80 Model 100: Never an Idle Moment," *PC*, Volume 2 Number 1).

The first mistake, of course, was not to borrow the whole setup a week before the trip and try it out. Although the instructions were generally clear, I still punched up the wrong combination of buttons at one point and cleared the memory of a 500-word story.

The direct connect cable was again a problem, but less so since it was easier to duck into someone's office and use the phone for a toll-free call without taking over the entire desk. Nevertheless, if I had run across a Radio Shack store, I would have bought an acoustic coupler.

I was a bit leery of taking the Model

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100 with me during the day, but it seemed to work out well. I was able to write with it during breaks, although the key clicks were sometimes a problem when I wanted to take notes during meetings.

The best feature is the absolute freedom from power cables. I could write in the airport bus, at the airport, during the flight (most but not all airlines allow the use of computers during flights), and even while waiting to register for a convention.

As for the computer itself, the keyboard and the display are serviceable although not luxurious. The keyboard, though less than full size, is still large enough for touch typing. The word processing program is less powerful than many for my full-sized PC, but it's quite good for a small machine.

Down the Wire

When deadlines occur, I want to be able to send the stories in from wherever I am. Electronic mail was the best choice, and I've been using MCI Mail. By calling a toll-free number, I could connect to MCI from anywhere. I dumped the stories from the Model 100 into the MCI computer, either sending them directly to their final destinations or to myself.

At home, I fired up my PC and downloaded my files without any problems. In effect, I got temporary storage, delivery, and conversion from Radio Shack to PC format for about \$6 per week. CompuServe or The Source will do the job as well. If you're paying for business travel anyway, the cost of any of these services is small in relation to your overall costs. MCI's big advantage over other services, aside from the toll-free number, is that for \$5 extra you can have your manuscript or report printed out and delivered overnight by Purolator to any of 20,000 cities and towns—just what you need if you have a hot item to report to the head office back home. If you expect to be sending a significant fraction of your output to people who don't have data communications hookups, MCI is the best way to go.

I've been tempted to plunk down close

to \$700 for a Model 100 and a few hundred more for the accessories and extra memory, but I'm waiting to read the reviews of the forthcoming MS-DOS and

PC-DOS lap-sized machines with liquid crystal displays. I've been reading the new product announcements, and it seems that the best is yet to come. ■



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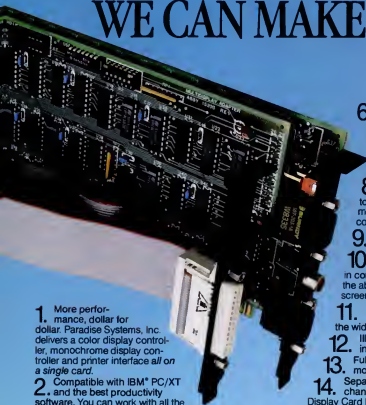
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Author, Author

For those who wish to develop their own interactive courseware, a new software program and an authoring language system can help you create computer-based instruction on the IBM PC.

Electronic learning has evolved as a logical outcome of information technology and might be viewed as a subset of interactive communications. Interactive courseware is an emerging genre of instructional software that exhibits frequent feedback and high responsiveness to user input. Good interactive courseware provides a stimulating, individualized learning experience that guides the student on a structured odyssey of educational discovery.

The most advanced courseware has analytic and branching properties that respond to the learner's strengths, weaknesses, and interests. Courseware is generally the product of a group effort. Typically, authoring teams of subject matter experts, graphic artists, technicians, documentation writers, analysts, designers, and programmers collaborate to create interactive courseware.

Authoring systems may be viewed as integrated packages of applications programs that contain a library of oft-repeated routines and useful macrocommands to eliminate the need for programming. Widespread use of such systems may automate training and education in the same way that *VisiCalc* changed the face of accounting.

In the courseware development process, authoring systems can drastically reduce the costs and time necessary to



produce quality courseware while accomplishing the required functions with a smaller, more focused authoring team—one person in some instances. Many of the current generation of commercial authoring systems allow instructional designers to develop and test complete courseware packages with absolutely no requirement that the designer have any knowledge of a programming language.

CAI Guru

To appreciate the simplicity of using today's sophisticated authoring systems, one might glance backwards 20 years to observe a graduate student at the University of Illinois, trying to create a genetics

lesson using the only tools available at that time: a primitive release of FORTRAN and assembly language.

One graduate assistant, Paul Tenczar, attempted to transfer the routine presentation of his topic, genetics, to the university computer. He admired the computer's ability to manipulate complex statistical data, and he figured he could program the beast to offer a preliminary, interactive explanation of genetics fundamentals so that he would not have to redescribe the copulations of fruit flies over and over again to undergraduates just beginning to learn genetics.

He managed to put together a lesson that not only did what it was originally intended to do, but also favorably impressed the University of Illinois faculty. Tenczar was made chief of a growing platoon of CAI enthusiasts at the University of Illinois and later invented the Tutor authoring language, which is used and respected to this day.

A CAI Mecca gradually developed at the University of Illinois. It was there that the prestigious, albeit costly and commercially unprofitable, Plato system was developed. Written in the Tutor language and residing on the mainframe, the Plato on-line system evolved to offer a vast and varied array of interactive lessons to the university community and to the world at large through Control Data Corporation,

EDUCATION

which bought out the Plato properties.

In 1983, Control Data showed a first profit on the Plato system. Part of that profit derived from the Plato Homelink service offered by the Control Data Publishing Division. Homelink is an electronic network available after business hours that offers an exceptional selection of CAI modules on a wide variety of subjects, electronic mail within the Plato community, and the ability to design and to store CAI lessons and graphics. It also provides some comprehensive on-line reference aids and user information. The system is accessible through local telephone links to users with PCs or compatibles at a bargain rate of \$5 an hour. Paul Tenczar, our erstwhile genetics scholar, now maintains a farm in Champaign, Illinois, where he's got the room to engage in experimental farming, raise pedigreed dogs, collect motorcycles, and generally indulge in rugged individualism. But that's not all that he's doing.

Two Options

Serious courseware developers planning applications for the IBM PC, XT,

EnCORE

Computer Teaching Corporation
1713 S. Neil
Champaign, IL 61820
(217) 398-2207

List Price: \$2,000

Requires: 192K RAM, color/graphics adapter, two double-sided disk drives.

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McGraw-Hill Interactive Authoring System

McGraw-Hill Book Company
Microcomputer Software Unit
1221 Avenue of the Americas
New York, NY 10020
(212) 512-6589

List Price: \$1,500

Requires: 128K RAM, two double-sided disk drives.

CIRCLE 716 ON READER SERVICE CARD

and the Apple II who are looking for the utility of an authoring system without sacrificing the flexibility and freedom of a problem-oriented language are advised to consider the *EnCORE* authoring language system by Computer Teaching Corporation, which is located in Champaign, Illinois and headed by Paul Tenczar.

The *EnCORE* authoring language is an evolved cognate of the Tutor language, but *EnCORE* has made the migration from the mainframe and now resides in the IBM PC and XT. Using *EnCORE*, which presently runs under PC-DOS 1.1 or 2.0, a courseware developer can write, test, and prepare lessons for publication on the PC, XT, or Apple II and avail himself of the language with a complete standalone programming capability. In addition, there's a growing, integrated set of utilities: full-color graphics support, user-definable character sets, automatic response analysis and feedback to students, an on-line reference manual for authors, computer-managed instruction, and external device interface, including mouse and light-pen support.

EnCORE is not easy to use. This system is more for the cognoscenti than the dilettanti. It is definitely a system that requires a thorough understanding of structured programming methodology. Its printed documentation leaves a lot to be desired, even though the on-line language reference manual is a great asset.

Because of the myriad capabilities that *EnCORE* offers, especially animation, it is lamentable that an *EnCORE* patron who spends \$2,000 for the system is not provided with a comprehensive, disk-based tutorial with an inventory of examples to illustrate what *EnCORE* can do. This situation is likely to improve as *EnCORE* builds momentum in the marketplace.

For those who would like to create computer-aided instruction on the IBM PC or XT without programming, there is a blue-chip choice at the easier end of the authoring system continuum, the *McGraw-Hill Interactive Authoring System*. This is a colorfully and superbly doc-

umented, menu-driven, relatively flexible system presently being offered in release version 3.1 by the Microcomputer Software Unit of the McGraw-Hill Book Company. The price is \$1,500 retail, but educators are eligible for a 30 percent discount.

A pioneer of authoring systems for the PC, McGraw-Hill has brought to market a smooth-running favorite for educators and trainers who are seeking a fast, efficient, and complete means of developing courseware on a local basis for diverse applications. A complete pedagogical treatment using presentation, multiple-choice, matching, fill-in-the-blank, and application/simulation screens is inherent to McGraw-Hill's system. Some may reject this pedagogy as too confining, but others will embrace it for its sound methodology and ease of use.

Designed by Steve Laliberte of Educational Management Services in Minneapolis and edited by Gerry Gleason of McGraw-Hill, the authoring system was painstakingly torn apart and tested by the Arthur Andersen accounting firm before it was first released. The latest release includes enhancements in response to customer demands for a facility that will capture screens from application software, a facility that allows up to 300 lesson screens to be placed on one diskette. The new version also provides XT-compatibility, user exits to application programs, 80-column color, and computer-managed instruction for up to 10 students on the lesson diskette.

The *EnCORE* authoring language system and the *McGraw-Hill Interactive Authoring System* are two premiere examples of first-rate tools that may be utilized to cultivate the fruits of interactive courseware. ■

Bob Rosensweet is director of the Interactive Authors Guild, associate producer of instructional media for LEARNINGWARE Corporation, and adjunct professor at New York University's Data Processing and Systems Analysis Institute.

Building a Medical Database: A Case History

When the vascular surgery department at Montefiore Hospital and Medical Center needed a database manager, DataEase fit the doctors' bill. Now it's become a hospital-wide standard.

DataEase, from Software Solutions of Milford, Connecticut, one of the new generation of relational database managers for the PC, bridges the gap between ease of use and powerful functions. We came across the program in our search for a database manager with which to start a vascular surgery registry at Montefiore Hospital and Medical Center.

We were looking for a program that was easy to use. Ideally it would employ menus, since it would be used by novices. It would have to handle several interrelated files with a large number of fields, and it would need to be flexible enough to permit the addition or modification of data fields easily without losing data. It would have to have powerful reporting capabilities, including important biostatistical functions.

Since DataEase appeared to meet all

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(203) 877-9268
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our criteria, we began building our database with it last year. We were impressed with the program's intuition and power.

Mastering the Menus

DataEase is completely menu-driven. After you sign on with the proper name and password, the main menu appears on the screen. It allows you to enter different parts of the program by pressing the appropriate numeric key. Most main menu choices lead to sublevel menus from which you can again select a function. The menus, written in English and designed for novice users, do not lead into a never-ending maze as some programs' menus do. After you develop an application you can easily design your own set of menus to

give you even better access to your individualized system.

One-line menus appear on the top line of the screen as prompts while you enter data or design forms. Even the form names and field names show up on one-line menus, so you don't have to remember the spellings or abbreviations you used during the definition process. In addition, the assignments of applicable function keys are always displayed on the bottom line of the screen.

The first step in setting up a database with DataEase is defining your data requirements by creating different forms. Each form can contain up to 255 data fields, and there is no restriction on the number of forms you can design per data-

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base. You can use up to eight screens in each form; records can be up to 8,000 characters long. Designing forms is probably the easiest and most fun part of this program. Fields are laid out on the screen

**You can specify that
a field is unique, that
it must be filled, or
that data should fall
within a certain
range.**

where you want them. For field attributes, you can choose text (alphanumeric), numeric strings (such as social security numbers or phone numbers), numbers (integers or fixed floating points), date, time, currency, yes/no, or multiple choice.

The multiple choice field is extremely important in medical databases, because medical information can be broken down into either yes/no or multiple choice. For example, you can categorize a patient's antidiabetic treatment as none, diet, oral medication, or insulin. When you predefine the categories, the information you collect is unambiguous. Entering information into the multiple choice fields is simple. The defined categories appear on the single line menu when you place the cursor in a field, and you can enter the data with only one key stroke. Other features add to the precision of the data elements. You can specify that a field is unique, that it must be filled, or that data should fall within a certain range. Multiple fields can be indexed for faster access, and these indexes are automatically updated.

We created several forms for our vascular database—one each for demographic information, history and examination, laboratory results, angiography, surgery, complications, and follow-up. The forms ranged from 50 to 140 fields in length and 150 to 680 bytes per record. (Multiple choice fields are stored as 1 byte only.) A printout shows the field attributes and how

many bytes are required for each form. We established relationships between these forms based on the patient's social security number and the dates of the procedures. Any number of such relationships may be established.

After you have designed the forms, they are immediately ready to receive data. You simply place the forms on the screen one by one, place the cursor in any field, and enter the appropriate information. For batch entry of a large number of records, you can fill several fields with default values that will be automatically entered for each record. Once you have entered the records, you can easily find a record matching certain criteria by pressing the View function key. It's easy to modify records or to delete them from the system. So far we have entered data from over 1,000 patients into the system. In the process, the forms we initially designed have gone through many changes, since we did not anticipate certain elements in advance. However, the form modification process is simple if the type of field does not have to be changed. You can change the field names, add more fields on the form, change the length of the fields, or add more choices to the multiple choice fields without losing data. The data are automatically reformatted by the system to fit the new form.

Generating Reports

Report generation is the heart of any database manager and is usually the most difficult part to master. *DataEase* generates reports using *DataEase* query language, an interactive language that resembles English and is clearly the most innovative aspect of the program. You are prompted to construct a query sentence with single keystrokes. All comparison operators, and/or, mathematical symbols, field names, and other messages are prompted one by one, which permits you to select the appropriate elements to construct the query sentence.

Once the reports are defined, you can store those that you will refer to frequent-

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Microsoft Flight Simulator	120.00	Speakeasy Mummies & Robots	17.00
Orion 2.0k	23.00	Speakeasy Soccer Trainer #1	17.00
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	Price		Price
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Conceptual Design Data Organizer	180.00	Research Project Version 2.0	70.00
Digital Research CP-M-86	33.00	Pro: My Self	70.00
Full Path Software: Salesman	30.00	Software Publishing Pro: Pro	60.00
Lotus Development Lotus 1-2-3	170.00	Software Publishing Pro: Pro	60.00
MSDOS Knowledge Man	250.00	Software Publishing Pro: Pro	60.00
More New & Save 4000	250.00	Software Publishing Pro: Pro	60.00
Microsoft 2.0 Computer	250.00	Software Publishing Pro: Pro	60.00
Microsoft Project Commander	210.00	Software Publishing Pro: Pro	60.00
Microsoft Word with Mouse	260.00	SP: Open Access	350.00

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Amdek View 300A	120.00 (2.50)	DECtalk 3.0	170.00 (2.50)
Amdek View 300B	140.00 (2.50)	DECtalk 3.0A	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0B	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0C	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0D	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0E	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0F	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0G	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0H	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0I	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0J	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0K	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0L	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0M	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0N	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0O	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0P	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Q	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0R	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0S	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0T	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0U	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0V	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0W	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0X	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Y	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Z	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0A	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0B	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0C	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0D	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0E	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0F	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0G	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0H	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0I	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0J	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0K	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0L	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0M	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0N	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0O	170.00 (2.50)
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Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0R	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0S	170.00 (2.50)
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Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0X	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Y	170.00 (2.50)
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Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0A	170.00 (2.50)
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Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0D	170.00 (2.50)
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Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0G	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0H	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0I	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0J	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0K	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0L	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0M	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0N	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0O	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0P	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Q	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0R	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0S	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0T	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0U	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0V	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0W	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0X	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Y	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Z	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0A	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0B	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0C	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0D	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0E	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0F	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0G	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0H	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0I	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0J	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0K	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0L	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0M	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0N	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0O	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0P	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Q	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0R	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0S	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0T	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0U	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0V	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0W	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0X	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Y	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Z	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0A	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0B	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0C	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0D	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0E	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0F	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0G	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0H	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0I	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0J	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0K	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0L	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0M	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0N	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0O	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0P	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Q	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0R	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0S	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0T	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0U	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0V	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0W	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0X	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Y	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Z	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0A	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0B	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0C	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0D	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0E	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0F	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0G	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0H	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0I	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0J	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0K	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0L	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0M	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0N	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0O	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0P	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Q	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0R	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0S	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0T	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0U	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0V	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0W	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0X	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Y	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0Z	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0A	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0B	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0C	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0D	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0E	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0F	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0G	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0H	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0I	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0J	170.00 (2.50)
Amdek Mail-matrix 4-in-1	410.00 (2.50)	DECtalk 3.0K	170.00 (2.50)
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MEDICINE

ly. You can even modify reports that have already been stored in the system. The program can design a simple columnar report output but you can also design spe-

cial report formats for form letters or to fill preprinted forms such as complicated insurance statements. *DataEase*'s statistical functions include count, percent,

mean, range, variance, standard deviation, and standard error. A special statistical module available from Software Solutions permits you to produce cumulative life table survival statistics on a selected group of patients. There is no method in *DataEase* to allow statistical comparisons of groups. However, we use the *DataEase* outputs with 1-2-3 templates to generate graphs and to perform chi-square tests and t-tests to compare different patient populations. *DataEase* report outputs can also be imported to spreadsheets or word processors. The report function also lets you enter information or modify existing information in a batch mode.

We have already begun to benefit from the computerization of our vascular registry. Our information is now more accurate, and we can easily retrieve or update it. We also write many clinical research papers for which data reduction and analysis tasks have been cumbersome and time-consuming. The database makes the chore of tracking patients relatively easy. We now generate reports listing the telephone numbers, addresses, and names of referring physicians for all patients not seen in the last 3 months; we can then have these patients tracked by phone or letter. We can easily update changes in patient movement and status, compare several treatment protocols, or review an individual surgeon's performance as compared with the performance of a peer group. We have also designed forms to keep records on selected bibliographies and to schedule patient appointments.

DataEase has become a standard product at our hospital, and many different applications have been developed by various departments. An informal users' group has formed and the members help each other with their applications. ■

Sushil K. Gupta is director of the vascular registry at Montefiore Hospital and Medical Center and Albert Einstein College of Medicine. Frank J. Veith is the chief of vascular surgery services at Montefiore/Einstein.

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Developing an Electronic Survey

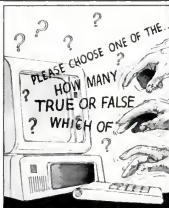
Time-tested survey techniques go into the design of micro-based questionnaires, but computer technology takes over to collect the data and analyze the results.

One of the most widely used data collection devices employed by business, government, and the university is the survey questionnaire. Traditionally these questionnaires have been administered with paper and pencil. Today, however, a researcher can use a micro to create a customized self-administered electronic questionnaire that gathers, edits, and uploads data to a mainframe, bypassing the paper-and-pencil stage of data collection completely.

A recent project designed to collect data on university students on a continuing basis required a self-administered questionnaire that could be presented to each student on a micro and that could automatically reboot for the next respondent.

The questionnaire itself had to be self-explanatory and attractively displayed on the monitor. Good error traps and easily understood error messages were essential. The order in which the questions were presented had to be random from respondent to respondent, and the questions had to be open-ended. For instance, "List at least four traits of a United States senator." Some of the respondent's own answers to earlier questions had to be presented for evaluation later in the questionnaire.

The survey responses were to be uploaded at the end of each day to a mainframe disk data set. When the responses for all subjects were gathered, the data sets



needed to be concatenated and analyzed using a mainframe statistical package.

An important advantage of using a micro for data collection is that there is no need for coding or keypunching. The data is entered by the respondent at the keyboard and can immediately be written to diskette after each response, thereby eliminating one source of measurement error. As the response is entered, the data can be cleaned and edited, since error routines can be built into the program.

One of the problems in any questionnaire administration is the response bias that can be introduced by fixing the question order for a given series of questions. The random-number generating capacity

of the micro can be used to present questions in random order, subsections in random order, randomly select a small subset of questions from a larger set, or randomly present parallel forms of the same questionnaire.

The electronic questionnaire can easily accommodate a branching format that provides follow-up questions to individuals, depending on their responses to certain questions.

Asking open-ended questions is also possible with the interactive questionnaire. Early in the questionnaire, a respondent could be asked to list the traits characteristic of a United States senator. Later, the traits entered by the respondent could be presented again on the screen, and the respondent could be asked to evaluate the importance of each trait.

Sitting in front of a screen and responding to an interactive questionnaire seems to capture the attention of most respondents in a way that the traditional paper-and-pencil questionnaire does not. This increased motivation can be an important factor in improving response rates.

Disadvantages of Using the Micro

A great deal of time and expertise is required to program a questionnaire and upload the data to a mainframe. A rule-of-thumb estimate for a well-polished program is a minimum of 50 programming

hours for one response hour. Obviously, this figure will vary with the experience of the programmer and the complexity of the program.

However, once a micro-based questionnaire has been programmed, certain subroutines, sections of code, and error routines can be used in subsequent projects. Because of the time investment, an electronic questionnaire is cost-effective only if the questionnaire will be used repeatedly or if it is short. While computer-assisted telephone interviewing questionnaire software exists, it is usually too expensive or difficult to adapt to specific computing environments. Armed with a PC and a little expertise, you can customize an electronic questionnaire.

If you choose to analyze the data on a mainframe, uploading it from the micro does take a considerable amount of time,

especially at 300 or 1200 baud. Ideally, you should design software to automatically upload the day's data sets at the end of each working day.

Using an electronic questionnaire allows you to design a program that can be automatically booted in the morning, pausing at the introduction until the first respondent of the day begins to enter answers at the keyboard. It can automatically restart and be ready for the next respondent's entries.

The questionnaire itself should be self-paced, with a clear screen display in which the questions are laid out attractively with an adequate number of blank lines between sentences and wide screen margins. The screen should be treated as a page, using boldface and underlining for emphasis. The sound capability of the machine can also be used to indicate ques-

tion change or invalid entries.

With the considerable variation in the amount of time an individual takes to complete a session, scheduling becomes important. Also, protection against unauthorized respondents through unique password assignment is imperative if your micros are easily accessible to outsiders. Small projects can be run with the questionnaire diskette in drive A with new data diskettes being placed in drive B as needed. Larger projects can keep the questionnaire in drive A but will need a diskette and data set management system for all the data diskettes or a hard disk for all the data. At the end of the day, the data sets can be either concatenated on the micro and uploaded to the mainframe via a communications package or sent up individually for each respondent and concatenated on the mainframe.

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Respondents' answers are generally stored in string variables, with subroutines used for error-trapping and question display wherever possible. If you plan to repeat a type of question a number of times, take advantage of the micro's capacity to hold the instructions and the scale constant while varying one portion of the question. For example, hundreds of traits can be evaluated on a scale of "very favorable" to "very unfavorable" by looping through an array in which the same screen is displayed, while the trait changes each time the respondent enters an answer. While information is being displayed on the screen, respondents often hit the Return key once and skip ahead by hitting it again once or twice in confusion, effectively answering with a null value. Clearing the keyboard buffer immediately upon presenting a new screen of questions and before the next input statement is one way to solve the problem.

In order to boot into the questionnaire (QUES.BAS), an AUTOEXEC.BAT file can be created that contains QUES.BAS with DATE and TIME prompts. The values of the DATE and TIME functions can be written into the data files, allowing calculation of the total time required to complete the questionnaire. When the PC first boots with the program disk in drive A, the program will request the time and date information and the questionnaire will begin executing for the first respondent. The program will restart for every subject that follows, if RUN "QUES.BAS" is the last statement in your program.

If you use a randomization routine, labels identifying the questions that were randomly assigned to the respondent need to be written to disk with the responses so the data can be sorted and merged for analysis. It is extremely important to record the question that was randomly assigned to

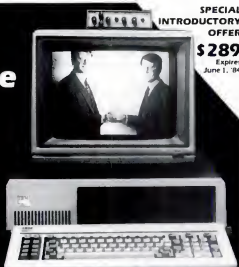
the respondent, since that information will be gone at the end of the session.

If open-ended questions are presented, the maximum line length that can be trans-

mitted to the mainframe needs to be determined, and the programs need to be designed so that each line a respondent enters is shorter than the maximum. ■

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A Well-Fed Printer

Lawyers must carefully consider the appearance of the printed page. Using the right paper-feed mechanism with your printer is one way to make a difference in your documents.

The statement "Get it in writing" has more significance to the lawyer than to perhaps any other professional. For lawyers, the printed word upholds a legal agreement and can be used as evidence to win a court case. Lawyers who use IBM PCs to produce documents must carefully consider the appearance of the printed page. This means not only selecting the right printer, but also determining the best paper-feed mechanism for that printer. Deciding whether to use a sheet- or tractor-feed mechanism is often more important than you might expect.

A good sheet feeder feeds the printer one individually cut sheet of paper at a time. Sheet feeders have a number of advantages over tractor feed mechanisms. Many of them accept various sizes of paper. Both forms and plain paper can be used in the paper bins. However, a sheet feeder can cost more than the printer itself, depending on the relative sophistication of each. The question is, are sheet feeders worth their price for the convenience and features they offer?

Phil Shuey, a lawyer and consultant in Denver, Colorado, believes that in most cases the answer is no; tractor feed is the way to go. But whether you should buy one depends on your needs and situation. For example, if you are using your own micro in your office, and you have a dot matrix printer that you use for printing



papers that will be circulated only within the firm, then a tractor feed should fill the bill.

On the other hand, if you use your printer for a greater variety of applications, the question becomes more difficult. Many lawyers have answered it by trying to obtain the benefits of a sheet feeder with a tractor feeder.

For example, one of the objections to tractor-feed paper is that when you tear off the paper you are left with little tufts on all four sides. Paper like this does not have the crisp, professional image that many lawyers desire. However, for a relatively inexpensive price, you can buy tractor-feed paper that has perforations cut with a

laser. Determining the difference between this and ordinary paper is difficult, but not impossible.

If micro tufts still bother you, another solution exists. You can also buy cut paper (including letterhead) that has been attached to a roll of tractor feed paper. The tractor feed paper acts as a carrier to run the cut sheets through the printer. Once a document has been printed, the cut paper can be peeled off the tractor paper carrier, and the hard copy will look like single sheets. However, keep in mind that this paper costs more than ordinary cut paper. You need to determine whether, over time, the additional cost exceeds the cost of a sheet feeder.

LAW

Another problem with using a tractor-feed printer in a law firm is that most lawyers use one kind of letterhead stationery for the first sheet and another kind for the second. If you use tractor-feed paper, whether it is printed with the lawyer's letterhead or cut stationery attached to a tractor feed carrier, you will have to contend with this problem. The only practical way to solve it is to only write one-page letters. For most lawyers, this is difficult.

A Texas lawyer had an ingenious solution to the problem. He had laser perforated 15-inch tractor-feed paper printed with his letterhead at the top, and a "letterfoot" at the bottom of each sheet which served as his stationery second sheets. His word processor was set up so that all first pages of letters ended 10 inches from the top of the stationery and were manually cut off

A sheet-fed operation is helpful in preparing and filling in the blanks on printed forms.

11 inches from the top. Second sheets for letters started 10 inches from the bottom, and the top 4 inches were cut off. For legal sized documents ($8\frac{1}{2} \times 14$), the printer would start far enough down the page that the top and bottom of the paper (which contained the letterhead and letterfoot) could be cut off. Similar spacing was also used for standard $8\frac{1}{2} \times 11$ paper. This solution is ingenious because it requires only one kind of paper. However, does this convenience make up for the effort of cutting each sheet of paper?

A sheet-fed operation is also helpful in preparing and filling in the blanks on printed forms. The same result can be accomplished with a tractor feeder, but it requires more thought, trouble, and expense. If you're going to be filling in many of the same forms repeatedly, consider having a printer prepare printed

forms on tractor feed paper.

Another solution is to design a program so carefully that the word processor prints in the correct place on the printed form. Then, using clear plastic overlays (with the form printed on them), the blank sheet prepared by the printer is placed under the plastic overlay and photocopied. This solution is less expensive than printed tractor-feed forms, it's also less automated.

Still another solution is to place the printed form in a tractor-feed plastic carrier. The carrier is a 14- or 15-inch sheet of plastic with tractor-feed holes along the side. You attach a printed paper form to it, the plastic forms carrier will carry the form through the printer, and the printer can fill in the form. I have seen plastic tractor feed carriers priced at less than \$10. This is the least expensive but also the least automated method of completing forms on a tractor-feed printer.

At some point in the future, as the graphics capabilities of printers continue to improve and prices continue to drop, the ideal solution is likely to arrive. If a printer's graphics capabilities were good enough, tractor-feed paper could be used, and the printer could print the lawyer's letterhead in addition to the contents of the letter. If printed forms have to be completed, printers may be able to print the form as well as the answers that go in the blanks. Printer technology may even reach the point where a blank form can be run through optical character readers that will then store the image necessary to reproduce and print such a form. The technology certainly exists; the question is whether a machine like this will come to market in a form that is reliable and affordable. An enormous amount of useful printer technology already exists today, especially for lawyers who are willing to take risks and experiment with the possibilities. ■

Albert L. Moses is a partner in the Columbia, South Carolina law firm of Lumpkin & Sherrill and is active with the American Bar Association's microcomputer projects.

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PC/STD Link and Mac Pac

Two peripheral devices permitting the user's system to link with the widely used STD BUS. PC/STD Link consists of two circuit cards linked by ribbon cable. One card is installed in the user's system, the other in any STD BUS enclosure. The boards serve as an interface and controller between the STD BUS peripherals and the user's system, providing parallel communications with optical isolation and parity checking. The PC/STD Link cards can be immediately installed in any existing STD BUS system.

The Mac Pac is a companion enclosure for PC/STD Link, providing space for up to 13 STD BUS printed circuit boards. The enclosure is styled to match the IBM PC and incorporates a power supply and internal cooling system.

(List Price: PC/STD Link and Mac Pac \$1,295 each)
rmac

716 Capitola Ave., #G
Capitola, CA 95010
(408) 476-9637

CIRCLE 774 ON READER
SERVICE CARD

Micro7400 Protocol Converter

A protocol converter permitting up to 12 asynchronous devices, including personal computers, to be linked to an IBM 3270 mainframe system. The Micro7400 appears as a 3274 Model 51C Cluster Controller, communicating in either bisync or SNA/SDLC protocol.

Features of the device include a Command Port, which allows an operator to alter operating parameters such as priority assignments, while also providing line monitoring, diagnostic, and control facilities. The



Micro7400 Protocol Converter, Micom Systems, Inc.

Command Port is augmented by two additional features that can be accessed from the attached terminals. These are TACT (Terminal Activated Channel Test) for remote line testing, and TICC (Terminal Initiated Channel Configuration) for setting and altering terminal-related parameters such as parity.

Five models of the Micro7400 Protocol Converter are available: four full-featured models having two, four, eight, or twelve asynchronous input channels, plus a lower-

priced, two-channel LTD model.

Also available from the device's manufacturer is software for the IBM PC that allows it to fully exploit the capabilities of the Micro 7400 when accessing a mainframe.

(List Price: \$1,650-\$4,750, depending upon model; PC Software \$175)

Micom Systems, Inc.
20151 Nordhoff St.
Chatsworth, CA 91311
(213) 988-8844
TWX: 910-494-4910

CIRCLE 775 ON READER
SERVICE CARD

LetterPro 20

A daisy wheel printer capable of printing at up to 20 characters per second. The printer can be ordered with a Centronics parallel, RS-232 serial, or Qume SPRINT 3 interface. It uses the same Multistrike ribbon cartridges and 96-character printwheels used by the SPRINT series printers. More than 100 different printwheels are presently available for use with the

PC/STD Link, rmac

printer.

(List Price: \$899)
Qume Corp.
2350 Qume Dr.
San Jose, CA 95131
(408) 942-4000
TWX: 910-338-0232

CIRCLE 776 ON READER
SERVICE CARD

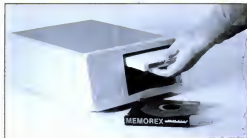
Qantex Model 7065 Printer

A dot matrix printer offering full Epson and Anadex control code compatibility, with printing speeds of up to 350 characters per second (cps) in high-speed mode. Other printing modes include a "compose" mode with 250 cps printing speed, near-letter-quality at 125 cps, and letter quality at 65 cps. In the graphics mode, the LetterPro 20 can produce a resolution of 144 x 144 dots/square inch, at a repetition rate of 1,500 dots per second per printhead needle.

Other features of the Model 7065 Printer include proportional spacing, right-hand margin justification, auto underlining, overprint and boldface, downloadable fonts, and an expandable print buffer. The printer can simultaneously store up to three type fonts. Standard fonts offered include Trend and Courier. Emphasis, Cubic, Scientific, APL, Script, Italics, Hebrew, Arabic, and other fonts are available as options.

The printer allows the use of both single-sheet and continuous-form paper via a combination friction roller/tractor mechanism. A paper tray is provided to help guide cut sheets into the print path.

The Model 7065 is equipped with two interfaces: a Centronics parallel and an RS-232 serial with



SX410 Cartridge Drive, Storex Corp.

current loop. Interfaces are selected using a DIP switch. The serial interface supports STX/ETX, XON/XOFF, Busy + and Busy - protocols. Transfer rates supported range from 110 to 19.2K bits per second.

(List Price: \$1,995)
N. Atlantic Industries, Inc.
60 Plant Ave.
Hauppauge, NY 11788
(800) 645-5292
(516) 582-6060

CIRCLE 777 ON READER
SERVICE CARD

SX410 Cartridge Drive

A mass storage device offering 5 megabytes fixed and 5 megabytes removable storage capacity using Memorex Minimark rigid disk cartridges. The Memorex cartridges are sealed against contamination until safely locked inside the drive; only then does the cartridge's access door open to admit the drive's heads.

The SX410 drive features a 40-millisecond average access time and a mean-time-before-failure (MTBF) rating of 8,000 hours.

(List Price: \$3,995)
Storex Corp.
999 Independence Ave.
Mountain View, CA 94043
(415) 961-1980

CIRCLE 778 ON READER
SERVICE CARD



Qantex Model 7065 Printer, N. Atlantic Industries, Inc.

Zeke

A removable cartridge tape drive offering up to 28 megabytes of formatted storage capacity per standard D600 cartridge. The Zeke provides full random access to

data, permitting it to be used as either a backup system for Winchester hard disks or as a standalone mass storage unit.

When used in a local area network, Zeke provides for a unique concurrent backup. As a disk is being closed on the working drive, that disk file is automatically backed up onto the Zeke cartridge. This capability eliminates the need to laboriously back up files at the end of each day or week.

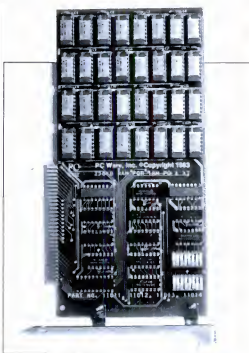
The device is plug-compatible with industry standard interfacing, permitting it to be used with most regular or mini-floppy drive controllers. Since operating systems see the Zeke as another disk drive, data stored on a Zeke cartridge can be used with other systems also incorporating a Zeke unit, even if the systems themselves are not otherwise compatible.

(List Price: \$1,195)
Zetratec Corp.
1625 Olympic Blvd.
Santa Monica, CA 90404
(213) 450-3934

CIRCLE 781 ON READER
SERVICE CARD

Dedicated Function Boards

A line of add-on printed circuit boards, each offering a dedicated function. Included in the product line are a parallel printer adapter, a serial communications



Dedicated Function Boards, PC Ware Inc.

board, and a 256K RAM board. The parallel printer adapter card can be used as a general-purpose I/O port, offering 12 buffered TTL latched outputs, 5 buffered TTL inputs, as well as software-controllable interrupts and board reset.

The serial communications adapter board supports full- or half-duplex direct or modem communications; a programmable control register; parity, overrun, and framing error checking; false-start bit detection; and

jumper-controlled choice of communications protocols.

The RAM board is available with from 0 to 256K pre-installed.

(List Price: Parallel Port Adapter \$89.95; Serial Communications Adapter \$94.95; RAM Board \$189.95-\$349.95)
PC Ware Inc.
4883 Tonino Dr.
San Jose, CA 95126
(408) 978-8626

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PC EYE Video Capture System

An interface board permitting images from a video camera or recorder to be digitized and entered directly into the user's system at rates up to 8 frames per second. The images may be digitized with 1 or 2 bits of intensity for compatibility with the IBM high-resolution graphics adapter, or digitized with 4 bits of intensity for 640 x 400 pixel resolution.

Images captured by the PC EYE board are transferred under Direct Memory Access (DMA) control into a system's memory at up to 1 megabyte per second. Successive frames may be captured and stored off-line for comparison or processing. Cameras and recorders offering EIA RS-170 or NTSC (standard video) interfaces can be connected directly to the PC EYE board. A crystal clock and digital divider assure accurate timing and stable synchronization.

Software support is available for printer output, annotation, storage, comparison, compression, and transmission of the captured video images.
(List Price: \$500)
Chorus Data Systems, Inc.
P.O. Box 810
Hollis, NH 03049
(603) 465-2290

CIRCLE 780 ON READER
SERVICE CARD

SOFTWARE

LAN: DATASTORE

A relational database management system (DBMS) specifically designed for local area network applications. The software supports such networks as EtherNet, Multilink, OmniNet, PCnet, and ShareNet, offering extended security and record level-locking facilities to protect a user's data files.

Using encrypted passwords, backed by a second level of internal tamper-proof security facilities, **LAN:DATASTORE** can prevent unauthorized users from accessing confidential data. In addition, provisions have been incorporated to permit tracking of changes made in data, including who made the changes and when.

Three versions of **LAN:DATASTORE** are available, one each for single users, for networks with two to five users, and for networks with up to 16 users. Features of the DBMS include on-line help screens and menus, function key- and mnemonic-driven commands, and simplified screen formatting tools. The software can handle up to 16 megabytes of storage. Each record can be as large as 16K bytes, and can contain as many as 300 fields. (List Price: single-user version \$495; small network version \$945; large network

version \$1,945)

Requires: 192K RAM, one disk drive, PC-DOS. Network versions require an interface card within each user's system.

Software Connections
1800 Wyatt Dr., #17
Santa Clara, CA 95054
(408) 988-3704

CIRCLE 752 ON READER
SERVICE CARD

SYSTAT

A statistical data management program with programming language and file handling facilities. **SYSTAT** can read rectangular, triangular, and hierarchical data files with fixed or variable length records, and merge or transform these files with single commands or user-designed command files.

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univariate and multivariate statistical and graphical procedures, **SYSTAT** includes more sophisticated routines for probability plots, exploratory data analysis, log-linear analysis of multiple-way tables, and factor analysis. Other features include multi-dimensional scaling, the multivariate general linear model, and multivariate analysis of variance.

All of **SYSTAT**'s statistical and data-handling modules share common commands that can be executed on single-user systems, local area networks, or time-sharing systems. The software can make full use of an 8087 arithmetic processor in the user's system though the math processor is not required.

(List Price: \$495)



SYSTAT, SYSTAT, Inc.

Requires: 256K RAM, two 320K disk drives, PC-DOS, **SYSTAT, Inc.**

1127 Ashbury Ave.
Evanston, IL 60202
(312) 866-5670

CIRCLE 785 ON READER
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PCModel

A general purpose modeling and simulation language system designed to assist in planning and analyzing automated and non-automated production facilities.

PCModel provides direct character-display of the modeled process. The software uses an interactive command structure permitting the user to interrupt, query, and modify models from the keyboard at any time. Customized character graphic screen representations of the modeled process provide a background over which modeled objects can be moved for realistic process animation.

PCModel permits changing model parameters, such as queue contents, to be displayed, facilitating model validation and "what if" case analyses.

(List Price: \$450; demo disk \$50)

Requires: 64K RAM, one disk drive, PC-DOS.
Simulation Software Systems
2470 Lone Oak Dr.
San Jose, CA 95121
(408) 270-2463

CIRCLE 751 ON READER
SERVICE CARD

SOFTWARE

<MICRO-TRACK>

A program designed to monitor personal computer usage within large organizations. The software uses a LOG-ON/LOG-OFF facility to record system usage. A range of events at a monitored PC can be tracked, including software usage. Account codes allow tracking of PC usage for project management or billing purposes.

<MICRO-TRACK> produces graphs showing PC usage, as well as more detailed textual reports.

(List Price: \$295)

Requires: 96K RAM, one disk drive, PC-DOS 2.0.
Westford Systems, Inc.
69 Providence Rd.
Westford, MA 01886
(617) 692-4381

CIRCLE 761 ON READER
SERVICE CARD

Innovative Mailing

A mailing list management program, containing 12 menu-driven utilities for creating, updating, and printing mailing lists. The software permits the user to print labels in zip code sequence, and to print rosters of included names either alphabetically or by a mail-key.
(List Price: \$36.75)

Requires: 128K RAM, two 320K drives, PC-DOS.
Hi-Tech Services
P.O. Box 370
Dunkirk, MD 20754

CIRCLE 769 ON READER
SERVICE CARD

The Idea Processor

A program combining a "cardfile"-style file manager with a word processing system. The software uses familiar names, such as file cards, drawers, and cabinets, to define the structure of its data filing element. Each file card created by the user can hold as much as 8K of data (equivalent to four full screens). Each drawer can contain up to 64,000 file cards. As many as ten drawers can be contained in a single cabinet.



The Idea Processor, IdeaWare Inc.

The number of cabinets is limited only by available storage capacity.

Any number of label keys can be assigned to each file card, permitting data to be easily retrieved by specifying a key or combination of keys. Once located, the whole file card or any specified part of it can be automatically transferred to *The Idea Processor's*

word processing element.

The word processing component of the software includes text editing and screen/print formatting functions equivalent to standalone word processing software. It makes use of the function keys in conjunction with the Shift, Ctrl, and Alt keys to provide a total of 40 functions, each identified by screen-bottom prompts. Editing capabilities include several different insert, delete, and move block options, as well as a range of

MCS Registration Management System

A menu-driven school registration program, capable of managing student, course, and grade information for up to 800 students. The software features error-handling capabilities, and over 20 reports, including class lists, grade reports, mailing labels, and user-defined reports from a built-in report generator.

The *Registration Management System* can provide detailed data in the following areas:

- Students: ID number, name, parents, address, grade, sex, birth date, advisor, credits attempted, credits completed, grade points, enrollment status, teacher's notes;
- Courses: code, section period, time, place, teacher, size, limit, description, and so on.

The software is divided into four sections, one each for Registration, Grading, Reports, and a File Utility section for making backup copies of files.

(List Price: \$795; demo disk \$39)

Requires: 128K RAM, two disk drives, PC-DOS.
Microtek Computer Services
P.O. Box 6443
Lincoln, NE 68506
(402) 489-5265

CIRCLE 748 ON READER
SERVICE CARD

find and replace options.

Formatting and printing capabilities include automatic footnotes.

(List Price: \$295)

Requires: 192K RAM, two disk drives, PC-DOS.
IdeaWare Inc.
225 Lafayette St. #712
New York, NY 10012
(212) 334-8043

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Smartmodem 1200	Call
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tronics Colorplus	Call
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Graphic Master	\$ 499
Quadram	
Quascolor I	\$ 199
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Corvus HD	Call
Dovang	
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* C. Itoh Starwriter F10	\$ 1,049
* C. Itoh Powerline 8510	\$ 369
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Print 132 w/4 options	1,547
Microprint	479
* Diablo 430 ECS	Call
* Diablo 630 API	Call
Epson	Call

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MT 160A	\$ 585
Speed	\$ 330
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* NEC 8023A	\$ 389
* NEC 2038	Call
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Int. Jet Printer	Call
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Gemini 10X	\$ 299
Gemini 15X	409
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Booka 10/15	Call
Delta 10/15	Call
* Teletex T1014	\$ 499
Transtar	
* 1-130 P/S	\$ 665
1-25P Dot Matrix	510
* 1-120P/S	475

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3M 5 1/4 DS DO Box	\$ 40
CDC	\$ 28
Model 5" DS DO	40
Maxell 5" DS DO	40
Verbatim 5" DS DO	35
8mm	35
Ultra Magnetic 5"	
DS, DO, 12 in box	35
(3 Boxes Diskettes Minimum)	

PLOTTERS

Amdek	
# DRY 100	\$ 599
# Amplot II	\$ 899

A variety of complete PC compatible systems are available at Oryx. For assistance in determining your needs, use our technical line! We will be happy to provide full support.

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Hyperion	

Enter F100 Sweet P	\$ 545
Heaven Instruments	Call
Panasonic Digital	
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(RS 232)	\$ 499

MISC.

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alpha protector	\$ 69
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Starter Kit	\$ 39
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KB X-Tension	
Cable EC2	\$ 35
Matrix X-Tension	
Cable EC1	\$ 45
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All Others	Call
EPD Super Protectors	Call
Flag 'W' File 514	\$ 22
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#807 Math Pkg	\$ 195
#87 Chip	169
#89 Others	Call

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Graphic Tablet	\$ 95
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Mouse Systems	
PC Mouse	\$ 229
Street Electronics	
Echo Speech Synth	
for IBM	\$ 179
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TG Jaystick	\$ 49
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Thunderclock	\$ 126
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CIRCLE 351 ON READER SERVICE CARD

Anagraph 1.0

A program that uses a 40 x 70 point graph to aid in analyzing a function. There are versions for both analytical (expressed by an equation) and tabulated functions. Using movable end points, the user may quickly replot any part of the function being analyzed. Using function keys, the user may recalculate the definite integral, the derivative, the root, the centroid, the length of arc, the average value, and the RMS value. The program will also plot integrals and derivatives. Special features include function storage on disk, automatic x-axis ranging, and on-line help screens.

(List Price: \$6.00)

Requires: 64K RAM, one disk drive, PC-DOS, monochrome graphics or color/graphics adapter.

Korsoft

Korkut Engineers Inc.

P.O. Box 7515

Metairie, LA 70011

(504) 887-6864

CIRCLE 724 ON READER SERVICE CARD

PQEDIT

A full-screen editor enabling the user to edit ASCII text files in a page format. Files created with the editor can have up to 9,999 lines of text, with up to 253 characters per line. User commands consist of one- or two-keystroke sequences, and include functions such



Clinical Research System, International Medical Products Corp.

as direct cursor control, horizontal and vertical scrolling, delete, add, split, join, copy and move lines, and locate and replace text.

PQEDIT is written in Assembler for fast response. It is an in-memory editor which loads an entire disk file into memory. With 96K RAM, the software can maintain a file size of approximately 61,000 characters in memory.

(List Price: \$29)

Requires: 48K RAM, one disk drive, PC-DOS.

Adam Systems Corp.

5919 Munson Ct.

Falls Church, VA 22041

(703) 671-7272

CIRCLE 763 ON READER SERVICE CARD

Clinical Research System

A patient data management program for physicians, designed to keep track of and analyze records for either clinical research or patients and practices. The software ties together patient data entry, a medical query system, statistical analysis, and graphics with the ability of handling multiple studies.

The Clinical Research System allows the user to enter specific patient data on either individual patients or groups of patients according to user-designed research protocol. Data entry formats can be tailored to each specific clinical study.

Graphic representations

of analyzed data can be formed as bar charts, line graphs, or scatter graphs. A basic package of descriptive, inferential parametric and nonparametric statistical tests is included with the software, and more sophisticated statistical analysis methods may be incorporated into the system as options.

(List Price: \$4,500)

Requires: 128K RAM, one disk drive, PC-DOS, color/graphics adapter.

International Medical

Products Corp.

4503 Moorland Ave.

Minneapolis, MN 55424

(612) 835-4018

CIRCLE 782 ON READER SERVICE CARD

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CIRCLE 508 ON READER SERVICE CARD

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"Need a 16-bit IBM-PC" to process your data?"

The first IBM compatible that IS compatible! A complete system including the PC-DOS® operating system from IBM™. Two thinline double-sided 5 1/4" Disk Drives hold 360K of formatted storage each, the other drive opening is fitted with a close-out plate. Removal of the plate will allow room for a Winchester Hard Disk. The Power Supply is like that of an IBM-PC XT™. Hard Disk ready! How compatible is the **XPC-XT**? It will run 1-2-3™, Flight Simulator™, dBASE II™, WordStar™, SuperCalc™, VisiCalc™ and hundreds of others. The system will also support MS-DOS™ 1.1 and 2.1, PC-DOS™ 2.2, CP/M-86™ and Unix Operating Systems. Add-on an additional 192K of RAM for a full 256K of on-board Memory for only \$195.00. This computer comes standard with 2 Serial and 1 parallel ports (IBM™ COM1 and COM2). No need to purchase Add-On cards.



Standard Features:

- PC-DOS™ Operating System Vers. 2.1
- 64K of parity checked RAM, expandable on-board to 256K
- 8088 16-bit CPU
- 5 IBM compatible expansion slots
- 4 DMA and 3 Timer channels
- Up to 32K of EPROM (supplied with full 8K)
- DOS BIOS on EPROM
- Full size capacitance touch keyboard with 10 function keys and calculator type numeric keypad
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- ALSO supports MS-DOS™ and CP/M-86™ Operating Systems
- Power Supply is Hard Disk ready, no need to add-on additional power
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If that incredibly LOW Total System price doesn't suit you, try this "Do It Yourself System" and take your pick of the wide range of options listed below. The Features: 64K RAM • Expandable to 256K • 4 DMA channels • 5 Expansion Slots • Runs MS/DOS™ and CP/M-86™ (not included) • Multi-function Keyboard and Cable • Hard Disk Ready Power Supply • 2 Serial and one Parallel Port • and MORE! • SYS-8000-00

Only

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FLOPPY INTERFACE

This is the standard Floppy Interface Card supplied in all systems not using Tape Back-up. It can access up to four drives in 48 or 96 TPI formats. The same high quality data separator as used in IBM™ counterparts, insures data integrity. BOA-8001-00 \$255.00

EXPANSION MEMORY

This super reliable, four layer design Memory Card can be expanded from 64K to 256K in 64K increments (at \$75.00 ea.). We've tested them all and can recommend this one with confidence. The price below with 64K and includes Spooler and RAMDISK software. BOA-8650-00 \$255.00

CALENDAR CLOCK

This simple but effective Card should be ordered with every system. Battery Back-up (naturally) keeps your Date Light up to date. Saves typing in the date everytime you "boot up" the system. BOA-8700-00 \$149.00

300/1200 BAUD MODEM

If this is your first computer, you will soon want it to Communicate. Communicate and the Source are on your screen minutes after you plug in this Custom Made Unit. Supplied with cable to plug into any wall outlet. Auto-Dial Software "remembers" phone numbers and log-in sequences to ease operation. Software included for each operating system. BOA-8725-00 \$295.00

SUPER 12 PAK MULTI-FUNCTION

Now we need a full page to describe this fantastic Card! Since we only have a little room, here are the features: IBM™ compatible joystick Port (2), Real-Time Chronograph (Battery Back-up), Parallel Port, Serial Port, 64K to 384K of Parity Memory, Print Spooler and RAM-DISK software, and supplied with 6K of Memory. BOA-8680-00 \$345.00



MANUFACTURING

HARD DISK ADD-ON Complete Packages

Includes BIOS Software, 5 1/4" Winchester Hard Disk, mounting hardware, Interface P.C.B. for expansion slot, and all the necessary power and data cables (the Power Supply in the XPC-XT is Hard Disk ready).

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| 10 Megabyte
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\$3295 |
| 40 Megabyte
\$1795 | 140 Megabyte
\$4195 |

Archive Tape Back-up unit shown above is of 20 and 40 megabyte capacity. Memtek unit will soon be available at 10 megabyte capacity at approximately One-Half the cost!

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If you are impressed with all the rave reviews that the Hercules Graphics Card gives, you will love ours! Made expressly for the XPC-XT by Hercules themselves, it runs everything the Hercules Card does (1-2-3™, dBase II, etc.) BOA-8500-00 \$395.00

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HARD DISK ONLY INTERFACE

A simple, quick solution to adding a Hard Disk to your XPC. All you need in this card, a Cable, and the Drive Header from 5 to 140 megabytes with minimum software configuration. Order with your System now or order later. Compatible with all the operating systems. BOA-8550-00 \$375.00

H.O./TAPE CONTROLLER

This package consists of a combination Interface Adaptor having SCSI H.D./TAPE Connector as well as the Floppy Controller. Two additional 5 1/4" form factor Boards are included and mount over the Tape Drive and Hard Disk 10, 20, 40 megabytes of Back-up is added to your Hard Disk. BOA-8675-00 \$750.00

Watchdog

A set of programs that provides both security control over access to a user's data and data encipherment protection. The programs, designed to be used with systems incorporating a hard disk, will allow access to files by users entering unique ID numbers and passwords. To these security measures, *Watchdog* adds file partitioning into sectors. To access data in these secured sectors, the user must have pre-established clearance or be able to supply the required password. Thus, users can be selectively admitted or excluded from different programs or files.

As an added defense against tampering by unauthorized users, files stored in a protected sector may be enciphered (encoded). The enciphering of data is apparent only to users who have entered a protected sector

without authorization.

Watchdog also adds an audit trail. With systems incorporating a clock/calendar board, the software monitors the time every user spends in each protected area. In cases where a user enters an optional project ID, *Watchdog* can track usage by project as well as area. Thus, the user can obtain reports of overall file activity or focus specifically on one person's use of the files.

(List Price: \$295)

Requires: 128K RAM, one disk drive and hard disk, PC-DOS 2.0 or 2.1.

Fischer Innis Systems Corp.
4175 Mercantile Ave.
Naples, FL 33942
(800) 237-4510

CIRCLE 783 ON READER
SERVICE CARD

ASM85

An assembly language programming aid that can convert memory code (mnemonics)

into assembly language code. The program generates a list file, an absolute hexadecimal file, and an ASCII file that is compatible with many EPROM programmers from the source code.

(List Price: \$49.95)

Requires: 64K RAM, one disk drive, PC-DOS.

S.E. DeRossett & Assoc.
800 Corporate Dr., #201
Lexington, KY 40503
(606) 223-4666

CIRCLE 760 ON READER
SERVICE CARD

VENIX/86

A licensed UNIX-based operating system that does not require hardware modifications or a separate coprocessing board to work with the user's system. *VENIX/86* features enhancements and revisions of the Bell Labs UNIX software to optimize memory usage, speed, and system reliability. A range of applications, utilities, and program development tools are included as standard features of the operating system, and *VENIX/86* can be run in either a single-user or a multi-user environment.

VENIX/86 allows users to organize hierarchical files and to designate the security level of these files; to share the resources of a single PC and its disk storage printer; and to run several programs simultaneously in a multi-tasking environment. Stan-

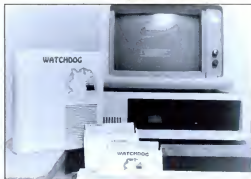
dard features of the operating system include electronic mail, text editing, program development tools, and an electronic calendar. Also included with *VENIX/86* are several languages (including a C Compiler, BASIC, an assembler, and the YACC compiler-writing language); a *Lexicon* analysis generator; a spelling checker; and a Table formatter.

The single-user version of the operating system can support a hardware configuration consisting of the basic system plus two serial ports, two additional Winchester hard disks, and one parallel port. If installed, the 8087 math co-processing IC chip is utilized without requiring software changes. The multi-user version permits additional "dumb terminals" to be linked to the user's system via standard RS-232 connectors.

The producers of *VENIX/86* also offer a series of software applications designed to use the operating system's capabilities. (List Price: Single-user version \$800; Multi-user version \$1,000)

Requires: 128K RAM, two 320K disk drives, asynchronous communications port. *Unisource Software Corp.*
71 Bent St.
Cambridge, MA 02141
(617) 491-1264

CIRCLE 723 ON READER
SERVICE CARD



Watchdog, Fischer Innis Systems Corp.

WindowMaster

A windowing program, enabling IBM PC-XT users to perform multiple computing tasks concurrently through the use of multiple windows on the display screen. The *WindowMaster* system permits users to open, close, expand, reduce, or move windows on the CRT screen to reach a number of applications easily.

The software is packaged with *WindowPack* applications programs, including *Graphics*; *Magic Worksheet*, a financial modeling and forecasting program; *Word Right*, a word processor with mail merge; *Analyst*, a database management program; *NAD*, name and address system; and *QSort*. The *WindowMaster* program can also be used with Lotus' *1-2-3*, *VisiCalc*, *WordStar*, and other popular applications programs.

The user can determine the size of the rectangular windows using the cursor keys. High-priority jobs can be up to full-screen size while background tasks, such as printing or sorting, can be kept in smaller windows, enlargeable as needed. In addition, the user can move data back and forth between windows, permitting the same data files to be accessed and processed by different applications programs.

(List Price: \$495)

Requires: 128K RAM, two

320K drives, PC-DOS 2.0.

Structured Systems

Group, Inc.

5204 Claremont Ave.

Oakland, CA 94618

(415) 547-1567

CIRCLE 773 ON READER
SERVICE CARD

File Transfer System (FTS)

A utility program providing bidirectional transfer of text files between the user's system and mainframe systems running OS/VS2 (SVS or MVS) TSO. The *File Transfer System* provides a high rate of transfer, error detection and correction facilities, a batch mode for unattended operation, and does not require hardware modifications in either the user's system or the mainframe to which it is connected.

FTS uses only standard OS/VS2 TSO facilities and expects standard VS2 responses to its requests. These responses include TSO mode messages (READY, EDIT, and INPUT), output from the LISTDS command, TSO informational messages, and VS2 data management messages. TSO commands required for transferring files are: ALLOCATE, CALL, EDIT, END, FREE, LISTDS, PROFILE, and TERMINAL. Prior to running *FTS*, the user must be logged onto TSO and must be at the TSO command

level (READY mode).

The *File Transfer System* will support files containing character data only. Data in any other format, such as control characters, binary, packed decimal, or machine instructions, must be converted to character data prior to transfer.

(List Price: \$295)

Requires: 64K RAM, one disk drive, PC-DOS, IRMA/IRMALETTE Communications board. *Mackensen Distributed Systems*

3323 Pearl St.

Santa Monica, CA 90405

(213) 452-5520

CIRCLE 766 ON READER
SERVICE CARD

FORLIB-PLUS

Three assembly language-coded function libraries, FORTRAN-coded subroutines, and demo programs for programmers working in FORTRAN. The three function libraries are designed to supplement function libraries contained within the user's version of FORTRAN, supporting graphics, communications, and file handling. Source code for the FORTRAN-coded subroutines is provided to aid the user in making calls to the function libraries.

FORLIB-PLUS features include the capability of one FORTRAN program calling another and passing data to it; routines that will permit interrupt-driven, buffered

data to be received by a developed program, with support for 9600-baud data transfers; and software that can make the user's applications DOS 2.0 pathname compatible.

(List Price: \$69.95)

Requires: 192K RAM, one 320K drive, PC-DOS 2.0, Microsoft FORTRAN Compiler ver. 3.1 or IBM FORTRAN Compiler.

Alpha Computer Service

P.O. Box 2517

Cypress, CA 90630

(714) 894-6808

CIRCLE 725 ON READER
SERVICE CARD

MyCalc

A new version of the *ZenCalc* spreadsheet program, featuring extensive help facilities for the novice. *MyCalc*'s numerical display formats include scientific, financial, and bar charts. Features of the software include sorting, multiple file handling, formula calculations, as well as facilities for customizing report column widths. Worksheets are stored in ASCII format, permitting files to be read by other programs.

(List Price: \$59.95)

Requires: 64K RAM, one disk drive, PC-DOS (PCjr: 128K RAM)

The Software Toolworks

15233 Ventura Blvd. #1118

Sherman Oaks, CA 91403

(818) 986-4885

CIRCLE 750 ON READER
SERVICE CARD

SOFTWARE

The Computer Chef Series

A software series consisting of three products: *Computer Chef*, *The Best of Wok Talk*, and *What's For Dinner*.

Computer Chef is a home database of recipes, capable of suggesting menus based upon ingredient lists or keywords entered by the user. It automatically adjusts recipes for needed numbers of servings or quantities of ingredients on hand. The program's files contain over 70 recipes, from appetizers to desserts. In addition, the user can add recipes to the database either directly or by integrating it with the other programs in the series.

The Best of Wok Talk contains over 100 recipes from the *Wok Talk* culinary newsletter. Recipes from all the major provinces of China have been included in the software's files. *The Best of Wok Talk* includes the *Computer Chef* database and utilities.

The What's For Dinner program adds over 200 recipes in two file categories to either of the programs described above. One file features 107 recipes for main and side dishes. The second file contains 108 dessert recipes.

(List Price: *Computer Chef* \$29.95 each; *What's For Dinner* \$19.95)

Requires: 64K RAM, one disk drive, PC-DOS.

The Software Toolworks
15233 Ventura Blvd. #1118
Sherman Oaks, CA 91403
(818) 986-4885

CIRCLE 758 ON READER
SERVICE CARD

FASTCLOSE

A loan closing program for mortgage and real estate brokers. The software can handle both personal and corporate mortgage loan analyses with calculations. It can automatically select and print disbursement checks and produce all necessary reports and forms, worksheets, and transactions recording for processing mortgage loans.

(List Price: *Broker-Only* version \$750; *Broker/Lender* version \$2,500)

Requires: 128K RAM, two 320K drives, PC-DOS.
Nelson Data Resources, Inc.

P.O. Box 24247
Omaha, NE 68124
(402) 397-3030

CIRCLE 762 ON READER
SERVICE CARD

LP88 Linear Programming

An applications program providing utilities for solving a range of linear programs with up to 255 constraints and 2,255 variables. The software employs a Revised Simple Algorithm to solve both maximum and minimum problems. Constraints may be any mix of "<=", ">=", or "=" re-

lations. The program includes a menu-driven system for setting up and solving problems, for controlling computations, and for generating tables of results and data. Additional features are spreadsheet-style input and editing, input from sequential files, a storage system for problems and bases, Simplex algorithm start/restart options, double precision arithmetic, primal and dual solutions, sensitivity analysis, optional 8087 support, a detailed user's guide, and sample problems.

(List Price: \$88)

Requires: 128K RAM, one disk drive, PC-DOS, printer.

Eastern Software Products, Inc.
4804 Tarpon Ln.
Alexandria, VA 22309
(703) 360-6942

CIRCLE 749 ON READER
SERVICE CARD

Commodity/Stock ChartMaster

A technical analysis and charting program permitting investors to track commodity and stock investments. The software can produce high-low-close bar charts, point-and-figure charts, moving average charts, and spread charts. Its database may be updated either electronically or manually.

The database stores up to 450 trading days of information per commodity or

stock. The number of stocks or commodities the user can maintain is limited only by the storage medium and capacity of the user's system. (List Price: \$400)

Requires: 128K RAM, two 320K drives, PC-DOS, color/graphics adapter.

Oster Communications, Inc.
219 Parkade
Cedar Falls, IA 50613
(319) 277-1278

CIRCLE 722 ON READER
SERVICE CARD

ScrollMate

An enhancement utility for PC-DOS, giving the operating system off-screen scrolling memory. The software permits the user to scroll up a DOS listing, such as a directory, storing up to 14 screens in an internal buffer. *ScrollMate* works with DOS commands, including DOS programs that write sequentially to the screen (not BASIC). *ScrollMate* can be used with DIR, TYPE, ED-LIN, DEBUG, Compilers, Assemblers, LINK, as well as with independently developed software. A separate Photo command is also provided to create a snapshot of display memory in a file. (List Price: \$69.95)

Requires: 64K RAM, one disk drive, PC-DOS.

Inner Loop Software
5456 McConnell Ave.
Los Angeles, CA 90066
(213) 822-2800

CIRCLE 767 ON READER
SERVICE CARD

BUSINESS SENSE



INTRODUCING THE DIABLO SERIES 36 PRINTER:

The sensible professional printer, this daisywheel offers more performance for less money than any other printer in its class. Performance like 35 characters per second. Performance like 4000 hours mean time between repairs. A range of options and accessories includes sheet feeders, forms tractors and a library of 100 printwheels.

And Diablo's unique API (All Purpose Interface) lets Series 36 play with all the most popular PC's (including

IBM's). But perhaps the most sensible thing about Series 36 is its price. At \$1595 suggested retail, Series 36 is a lot more printer for a lot less money than the competition. And that just makes sense.

To find out where you can see Series 36 and the other fine Diablo products call 800-556-1234 ext. 186. In California call 800-441-2345 ext. 186. Diablo Systems Inc., Fremont, California. A Xerox company.

Diablo Printers

CIRCLE 224 ON READER SERVICE CARD

BUSIN

Why Did Jack2 Beat 1-2-3, Lisa, VisiOn, And The Rest... Challenge After Challenge?

"Truly integrated. Free form layout. Really fast."

"What you see is what you get from screen to printed page."

"Super output quality. Much better than others."

"Change a number in text. It changes everything else."

"The best integrated product I've seen."

— Challenge Observers

KINGS PARK, NY - Jack2 was ranked as the best document preparation software by Challenge observers in New York, Philadelphia, and San Francisco. Competing with integrated software packages such as WordStar/Lotus 1-2-3, Lisa, VisiOn, Peachtext 5000, Context MBA, and MultiMate/SuperCalc 3, Jack2 was able to complete the three problems presented to

contestants faster and with a more impressive printed output.

Observers felt that Jack2's ability to prepare documents with live spreadsheets and charts embedded in text, live calculations in the middle of sentences, without windows, makes Jack2 the ultimate in integrated software. "Or," as one observer commented, "words, numbers, and pictures all on the same page is what true integration is all about."

However, the major reason observers thought Jack2 won was its unique ability to adapt to change. In the middle of the competition, contestants were stopped, just as they might in a normal business situation, and a number of changes were made in the problem information. "Jack2 was able to turn those changes around with ease," another observer said, "while with several of the others, the contestants had to start all over again."

Ask your dealer
for a demonstration today!
Or, call us at
800-645-4513

Jack2



CIRCLE 177 ON READER SERVICE CARD

I want to join The Jack2 Challenge!

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MAIL TO: _____

Business Solutions Inc., 60 East Main Street, Kings Park, New York 11754

The Prowriter Utilities

A print utility program for users' systems equipped with C. Itoh Prowriter or NEC 8023/8025 series dot matrix printers. The software is written in assembly language, and offers a module for Epson-to-Prowriter code conversion, for programs such as Lotus' 1-2-3, *Fancy Font*, *TypeFaces*, and *SuperCalc III*; a screen dump module which will print the IBM upper character set while in text mode; and three separate graphics dump modules. Also featured is an on-line printer control utility which enables font, margin, tab, and direction changes from the keyboard, regardless of the system being run.

(List Price: \$44.95)

Requires: 64K RAM, one disk drive, PC-DOS, listed printer.

Courtnir Enterprises
P.O. Box 231190
San Diego, CA 92123
(619) 569-8308

CIRCLE 756 ON READER
SERVICE CARD

Thoroughbred Color Business Graphics

A presentation graphics program for the IBM PC/XT that can produce line or bar graphs and charts and combine any selection of these charts on one screen. Graphs can be designed to the user's specifications or can be automatically scaled

to the existing data. Labels, legends, and text can be placed at any angle, location, and in any color on the screen, in either roman or italic type, in any width or height.

The program is designed to be integrated with other *Thoroughbred* software, which includes *Thoroughbred/OS*, a multi-user BASIC operating system; *Thoroughbred SMC BASIC*; *Thoroughbred IDOL*, a database management/applications development program; and a line of business software applications.

(List Price: \$595)

Requires: 128K RAM, one disk drive, hard disk, *Thoroughbred/OS* or UNIX, Tektronix 4027-compatible monitor, SMC *Thoroughbred BASIC*.

Science Management Corp.
1011 Rt. 22, PO Box 6800
Bridgewater, NJ 08807
(201) 685-9000

CIRCLE 757 ON READER
SERVICE CARD

Lab Management System

A database management system specifically designed for use by an analytical chemistry laboratory involved in routinely scheduled testings. Standard features of the software include a customizable format, with up to 20 fields accepting both numeric and/or alphabetic data; on-screen editing facilities; multiple-key

substring search routines; and the ability to create custom reports in tabular formats and print assay result slips.

The Lab Management System is divided into two sections. The first part of the database contains the fields for information entered by the analyst as data is generated. The second part contains data related to the specific sample that is being tested.

Other capabilities of the software include statistical analysis of test results and the ability to merge text files stored on different diskettes. *The Lab Management System* is written in BASIC and includes source code, permitting the user to make modifications if necessary.

(List Price: \$3,000)

Requires: 64K RAM, two 320K drives, PC-DOS, BASIC Interpreter.

Scientific Software
2 Sequoia Tree Ln.
Irvine, CA 92715
(714) 786-8366

CIRCLE 765 ON READER
SERVICE CARD

WATER and GEOTEMP

Two programs for calculating thermodynamic properties of water and geothermal resources. *WATER* is designed to be used to calculate the properties of water and/or steam for engineering design and analysis. The

input and output can be specified in any combination of SI or engineering units. The user can specify the conditions for the calculation from a menu of 14 state pairs. In addition to the usual thermodynamic variables, *WATER* can calculate heat capacity, compressibility, sound speed, Z-factor, and viscosity.

GEOTEMP can calculate the probable temperature of a geothermal resource, using geochemical data from hot springs or wells to compute the ionic charge balance and reservoir temperature.

(List Price: *WATER* \$179; *GEOTEMP* \$99)

Requires: *WATER*: 96K RAM, two disk drives, PC-DOS 2.0; *GEOTEMP*: 48K RAM, one disk drive, PC-DOS 2.0.

BG Software
2000 Center St., #302
Berkeley, CA 94704
(415) 841-9417

CIRCLE 750 ON READER
SERVICE CARD

Project Manager Workbench

A project/resource planning program, utilizing Gantt charts, networking tools, and resource allocation worksheets to control project scheduling and planning where resources are a major consideration.

The Project Manager Workbench program incorporates three techniques to optimize use of resources

within a project. First, the software makes use of multiple windows to tie together the software's various components, permitting recorded activities to be modified in all components at the same time.

Second, "work completed" and "time-to-complete" data are maintained for immediate display or printed report analyses of ahead/behind status of tasks, task groupings, and projects.

Third, autoscheduling facilities based upon an efficient scheduling algorithm can create project plans that meet dependency and resource constraints. The user specifies maximum resource loading, durations of project activities, and dependencies; the software then generates an interactive Gantt chart where each activity is scheduled to the earliest Start Date which does not overload resources.

The software features single keystroke commands, an on-line tutorial, and a flexible calendar permitting expansion of chart time scales from days to months. (List Price: \$750)

Requires: 256K RAM, one disk drive, PC-DOS.
Applied Business Technology Corp.
76 Lighthouse
New York, NY 10013
(212) 246-0641

CIRCLE 755 ON READER SERVICE CARD

R:base 6000

A multi-user version of the *R:base 4000* relational database management program. *R:base 6000* is designed for use with clustered terminal systems and local area networks. Multi-user features include password security, record level-locking, queuing during sorting and record modification, and concurrent database access

form. In addition, *dBASE II* files can easily be converted for use with *R:base 6000*. (List Price: \$1,595 per file server)

Requires: 256K RAM, two 320K drives, UNIX.
Microrim, Inc.
1750 112th Ave., N.E.
Bellevue, WA 98004
(206) 453-6017

CIRCLE 784 ON READER SERVICE CARD



R:base 6000, Microrim, Inc.

among all the users in a local area network.

Another *R:base 6000* function lets the user create command files to execute a sequence of specific instructions with one statement. To edit or update records within a database, a user can utilize either custom-designed screen forms or the system's default

Order Processing program include interfaces to other modules in the series as follows: *Accounts Payable*, for analysis of cash flow requirements and processing of vendor payments; *Inventory Control*, for automatic on-line updating of materials in stock and on order; *Job Costing*, for automatically updating lists of materials, labor, equipment, overhead, and miscellaneous costs by job and phase; and a *General Ledger* interface for unlimited expense distribution.

In addition, the *Purchase Order Processing System* is linked to the *Team Manager* report-writing facility. The report writer allows customization of reports by the user through selection of report components from a data dictionary of over 800 elements. The report writer also permits data from *Purchase Order Processing* and the other accounting applications to be reformatted for use by word processing and spreadsheet programs. (List Price: \$695)

Requires: 128K RAM, two 320K drives, PC-DOS, *Accounts Payable* program, BASIC Interpreter.
Open Systems Inc.
430 Oak Grove
Minneapolis, MN 55403
(612) 870-3515
TWX: 910-576-1743

CIRCLE 772 ON READER SERVICE CARD

Purchase Order Processing System

A new addition to the *Software Fitness* accounting software series, offering purchase order/expense control facilities. The software can be used either with the entire accounting series, or solely with the *Accounts Payable* program.

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Compaq 128K, 1 Drive	\$1895
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PC 2, 128K, 2 - 320K Drives	\$2550
PC 2 +	2050

COLUMBIA	
1600-1, 2-Drives (360K)	\$2595
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MPC-XP Portable	2395

SANYO	
MBC 550, 1-Drive, software	\$ 789
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2-Drives, 128K, 2 Ser. 1 Par Port, Color Graphics Card & Hi-Res. Green Monitor	\$1895

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HERCULES	
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INTERNATIONAL

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MediCard Jr.

A medical data management program designed for the IBM PCjr. *MediCard Jr.* allows small medical practices to automate their private patient billing and insurance claim form preparations without requiring an extensive investment in computer equipment.

The program can be used with *VisiCalc 1.1* for performing analyses of billing activity.

(List Price: \$359.95)

Requires: 128K RAM, one disk drive, PC DOS 2.1.
CMA Micro Computer
55722 Santa Fe Trail
Yuca Valley, CA 92284
(619) 365-9718

CIRCLE 712 ON READER
SERVICE CARD

DISK-TRAN

A PC DOS enhancement, permitting users to read, write, and format diskettes for other computer systems. Versions of *DISK-TRAN* are available for accessing disks formatted for KayPro, Cromenco, and Osborne systems.

Supplemental utilities available for the *DISK-TRAN* software include *GW*, a "global write" program, to write the contents of PC DOS disk to one formatted for another system, and *GR*, for reading the contents of a foreign disk to one formatted for PC DOS.

(List Price: *DISK-TRAN* \$30 each format; *GW* and

GR additions \$5)

Requires: 64K, one disk drive, PC DOS.

Computer Consultants to Business

1033 Bishop Walsh Rd.
Cumberland, MD 21502
(301) 759-1260

CIRCLE 711 ON READER
SERVICE CARD

Screen Saver

A utility program that automatically shuts off the CRT screen after two minutes of inactivity at the keyboard, preventing screen phosphor burn. The screen can be reactivated by hitting any key, restoring the display. The utility is compatible with most applications software, including *WordStar* and Lotus' *1-2-3*.

(List Price: \$29.95)

Requires: 64K RAM, one disk drive, PC-DOS.
SOLTEK Enterprises
P.O. Box C, Dept. PC
Orange City, IA 51041

CIRCLE 710 ON READER
SERVICE CARD

The Prospector

A sales management database program that can support personal sales calls, tele-marketing, and direct-mail advertising. The program is written in COBOL, and is compatible with software such as *WordStar*.

Among the major features of *The Prospector* is the ability to create and maintain activity files with unlimited commentary on

each sales prospect; the ability to sort clients/prospects by telephone area codes; the capability of scrolling through activity records on screen; as well as the ability to set up follow-up schedules, write *WordStar*-compatible files for personalized mailings, and to list file selections by a number of user-selectable criteria.

(List Price: \$300)

Requires: 128K, two disk drives, PC-DOS.
Executive Data Systems,
Inc.

290 Interstate N., #116
Atlanta, GA 30339
(404) 955-3374

CIRCLE 708 ON READER
SERVICE CARD

Mailing List

A program to print address labels and mailing lists from a master file of names and addresses. The program has a built-in list management system, allowing the user to add, alter, or delete address data to master files.

In addition to the address data, the program can also store a variety of descriptive information for each address entry. This allows the user to select particular subsets of addresses from a master file for a given mailing. *Mailing List* is menu-driven, and its data formatting procedures can accommodate a range of label forms.

(List Price: \$65)

Requires: 64K RAM, one 320K drive, PC-DOS,

printer.

Soft-Ray Systems
P.O. Box 70711
Sunnyvale, CA 94086
(408) 733-1938

CIRCLE 705 ON READER
SERVICE CARD

Name Directory

A mailing list management program capable of storing up to 1000 records on a single diskette. It produces mailing labels and record lists according to user-defined catalog codes, or geographically according to area codes, states, zip codes, or partial zip codes. Each record created by *Name Directory* contains a field for names, street address, city/state/zip, phone, and catalog code.

Name Directory allows record searching by name, record number, or catalog code, and files by names or phone numbers. All functions are selected from menus; user commands and expected replies are constantly displayed.

Other features of the software include data previewing prior to printing, security lock for access, and privacy protection.

(List Price: \$40)

Requires: 16K RAM, one disk drive, PC DOS 2.0.
TARRTEC International,
Inc.

P.O. Box 81
Comack, NY 11725

CIRCLE 704 ON READER
SERVICE CARD

MICROSEEK

An asynchronous communications program for linking IBM PCs to mainframe systems. It includes facilities for transferring ASCII and binary files, TTY/II terminal emulation, automatic logons, and the ability to automate repetitive PC/host tasks. A second version of the program, *MICROSEEK Plus*, is also available that includes a mainframe handshaking program for detection and correction of transmission errors.

MICROSEEK is a command-based system, permitting users to enter commands either singly from the keyboard, or in sets from user-defined command files. The ability to create command files facilitates the automatic execution of repetitive tasks in unattended operations, as well as helping to eliminate inadvertent errors.

Included with *MICROSEEK* are pre-programmed "sequence" file structures, which are activated when commands are issued by the user. The sequence files contain the basic instructions setting up the communications environment between the user's system and the mainframe system. The sequence files offered with the program provide automatic connection to in-house MVS/TSO and VM/CMS systems,

public information services such as Dow Jones News/Retrieval Service, The Source and CompuServe, as well as Comshare's Commander II, VM/CMS and MVS/TSO timesharing services.

(List Price: \$200)

Requires: 96K RAM, one disk drive, PC-DOS, serial communications port.

Comshare, Inc.

3001 S. State St.
Ann Arbor, MI 48106
(313) 994-4800

CIRCLE 702 ON READER
SERVICE CARD

Perishables Management System (PMS)

A program to control the meat, produce, and deli departments within a supermarket or food wholesaler's distribution center. *PMS* offers a range of 125 reports generated by its single entry system. Reports are available for inventory based on tonnage, store sales, department sales, customer count, labor, and other factors affecting day-to-day business.

A special utility included with the software permits the user to perform meat cutting tests, to see quickly the results of three different pricing levels at one time.

(List Price: \$2,800)

Requires: 128K, two disk drives, 10 MB Hard Disk, PC DOS 2.0.

Supermarket Data Systems, Inc.

95 Spring St.

P.O. Box 398
Auburn, ME 04210
(207) 782-5061

CIRCLE 703 ON READER
SERVICE CARD

PC Statistician

A general statistical analysis program permitting the user to readily design files, then count, search, sort, review, and edit data following a series of menu screens. Other functions of *PC Statistician* include file ranking, indexing, and transformations.

For large data files, the software can generate automatic random samples of data for analysis.

PC Statistician also offers graphics capabilities including scatter plots, bar graphs, scatter plots, and curve fitting. Graphs can be displayed, saved to disk, or directed to a printer for a hard copy record.

(List Price: \$300)

Requires: 128K, one 320K drive, PC DOS 2.0.

Human Systems Dynamics
9010 Reseda Blvd., #222
Northridge, CA 91324

CIRCLE 714 ON READER
SERVICE CARD

File Mover

A communications program capable of transferring any type of file between computers over a serial link, even if the computers use different operating systems. The program features transfer rates of up to 9600

baud, and error detection and correction protocol with checksums and automatic retry facilities.

(List Price: \$59.95)

Requires: 64K, one disk drive, PC-DOS, serial communications port.

Electrokonstul A/S
Konnerrudgt 3
Dremmen N-3000
Norway
(03) 83 15 00

CIRCLE 701 ON READER
SERVICE CARD

Investment Strategist

A program designed to determine the economic value of tax-sheltered investments. *The Investment Strategist* permits the user to analyze complex investment situations to determine a tax shelter's feasibility, comparing the rates of returns for several types of investments. Up to 15 years of financial data can be entered.

The program identifies economic benefits of a tax shelter, such as possible tax savings, cash distributions, and capital gains. The software focuses on after-tax benefits, while measuring a tax shelter's true economic value.

(List Price: \$395)

Requires: 128K RAM, two 320K drives, PC-DOS.

XQ Software
4357 Park Dr.
Norcross, GA 30093
(404) 923-2880

CIRCLE 753 ON READER
SERVICE CARD

How many ways can you think of to use a Nelson?



2 Full Nelson
RIGHT STACK



3 Full Nelson
LEFT STACK



4 Full Nelson
REAR STACK



1 Full Nelson
FRONT STACK



5 1/2 Nelson



6 Nelson
Cart



1 Full Nelson FRONT STACK

The ideal solution for small offices, or rooms with limited lateral space. The PC and Printer Modules both face forward for easy access and use.

2 Full Nelson RIGHT STACK

Move into an office with a little more room? Simply rotate your PC Module 90° from the Front Stack position, and voila: added usefulness in mere minutes! The lateral configuration gives you more legroom, allowing you to compute and print simultaneously in comfort and style.

3 Full Nelson LEFT STACK

If your office space or furnishings change 180° you don't have to contemplate jarring your printer up against the side of your desk—just detach and rotate your PC Module to the Left Stack position, and reap all the advantages of a Right Stack from a different point of view.

4 Full Nelson REAR STACK

This is the configuration for those with rare and unusual needs. The Nelson not only follows you around, but adapts to any reasonable situation you put it into. Plus, if you have many offices with many separate

computers to account for, the Nelson flexibility simplifies your task of fitting computers into multiple space requirements.

5 1/2 Nelson

Many users do not need a Printer Module. Either you do not have a printer (yet), or you have a distributive processing environment with a centralized printing capability. All you need is secure housing for your computer or terminal. The 1/2 Nelson is the compact and convenient choice for you.

6 Nelson Cart

On the other hand, if you need printer mobility, you can use a Nelson Cart. Sturdy and durable, complete with shelving and vanity plate, the Nelson cart takes your printer where it is needed.

7-11 Details, Details, Details.

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Sometimes the hardest decision on how to use your Nelson is where to put it so everyone will see and admire it.

And the second hardest decision is whether or not to let the cat out of the bag on how little it actually costs.

12 How about you?

Nelson Modularity is designed to let you fit your PC system configuration to your actual space. We, of course, can think of a lot of ways to use a Nelson. But the important way is the one that works for you.

So put on your thinking cap. Planning your office space can be fun. Especially when you know that if you ever change your mind, or expand your requirements, if you're using a Nelson you can always change the furniture you already have to the furniture you need.

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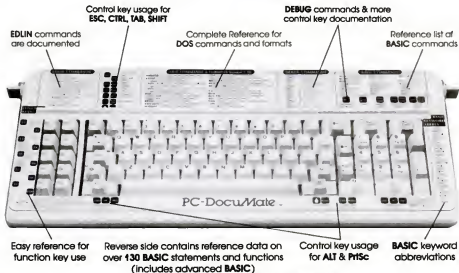
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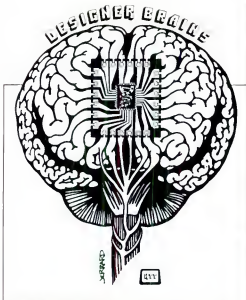
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Raleigh, N. C. 27619

ACCESSORIES



Designer Brains T-Shirts, Hi-Tech T's

ACCESSORIES

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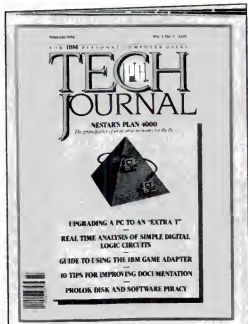
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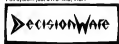
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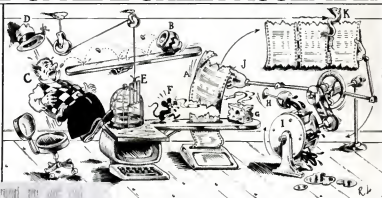
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PC User Groups

This list is a partial directory of PC user group names and addresses. Use this listing to locate other PC aficionados who congregate in your area or around the world.

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South Eastern Michigan Computer Organization IBM SIG
c/o Darrell Frappier
P.O. Box 02426
Detroit, MI 48202
(313) 532-1390

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Minneapolis User Group
c/o Peter LeNeau
100 N. 6th St.
Minneapolis MN 55403
(612) 339-3233

Twin Cities PC User Group
P.O. Box 3163
Minneapolis, MN 55403

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Columbia PC Users Group
c/o Jennifer DuPont
1560 Daniel Boone Blvd.
Columbia, MO 65201
(314) 449-7316

Kansas City IBM PC Users Group
c/o Bill Meeker
6020 Walnut St.
Kansas City, MO 64113
(816) 444-8709



IBM PC Users Group of St. Louis
c/o Dave Zumbro
P.O. Box 837
St. Louis, MO 63188
CompuServe #74405, 1252

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c/o Cynthia W. Harriman
57 South St.
Portsmouth, NH 03801
(603) 436-1608

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Central Jersey IBM/PC
Information Exchange
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Red Bank, NJ 07701
(202) 842-5800

North Jersey IBM PC Club
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New Providence, NJ 07974

Princeton IBM PC Users Group
P.O. Box 121
Princeton, NJ 08540

The Amateur Computer Group of New Jersey
c/o Carol A. Ziemba
IBM PC Users Group
P.O. Box 319
South Bound Brook, NJ 08880
(201) 885-3569

NEW YORK

QNPC
c/o Nathan Chao
Dept. of Computer Technology
Queensborough Community College
Bayside, NY 11364
(212) 631-6207

East Coast Club
c/o Richard Parker
ComputerLand
79 Westbury Ave.
Carle Place, NY 11514

NYPC: The NY IBM Personal Computer Users Group
80 Wall St., #614
New York, NY 10005
(212) 533-NYPC

PC will publish a periodic listing of PC user groups. Send new addresses or address changes to "Club News," PC, One Park Ave., New York, NY 10016. New groups and address changes are shown entirely in **boldface**.

CLUB NEWS

The Manhattan IBM Micro Club

c/o Helaine Head
360 Central Park West
New York, NY 10025
(212) 222-9027

IBM PC Users Group of the New York Amateur Computer Club, Inc.

P.O. Box 106, Church St. Station
New York, NY 10008
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The Long Island Computer Assoc.

P.O. Box 280
Commack, NY 11725

Picture City Personal Computer Programming Club

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Westchester PC Users' Group

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Larchmont, NY 10538
(914) 834-2012

BIBMUG

Buffalo IBM User's Group
P.O. Box 1487
Buffalo, NY 14221

The Northeastern New York IBM Personal Computer Users Group

c/o Jim Cummins
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Ballston Lake, NY 12019
(518) 399-3016

NORTH CAROLINA

IBM-PC Users Club of Asheville, N.C.

c/o Richard L. Davis
142 Edwin Place
Asheville, NC 28801
(704) 252-7529

NORTH DAKOTA

Fargo IBM Personal Computer Users Group

c/o Loren D. Jones
1339 Seventh Ave. S.
Fargo, ND 58103
(701) 280-2608

Grand Forks IBM Personal Computer Users Group

c/o John D. Hilley
717 Ives St.
Buxton, ND 58218
(701) 847-2935

OHIO

ACORN: Greater Cincinnati IBM PC User's Group

c/o Greg Lange
P.O. Box 3097
Cincinnati, OH 45201

Western Reserve IBM PC Association

c/o Larry Gavin
ComputerLand
2000 North Road SE
Warren, OH 44484

IBM-PC Users Club

c/o Chuck Harrington
315 Cutler Hall
Ohio University
Athens, OH 45701
(614) 594-6125

Northeast Ohio PC Club

c/o Rocky River Library
1600 Hampton Rd.
Rocky River, OH 44116

Greater Cleveland PC Users Group

c/o Roy McCartney
30704 Royalview Dr.
Willowick, OH 44094
(216) 944-5173

Mansfield Area IBM PC Users Group

c/o Gary Stiffler
1145 Conwell Ave.
Willard, OH 44890
(419) 935-0111

Akron/Canton PC Users Group

c/o James C. Finucane
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Alliance, OH 44601
(216) 935-0252

Columbus IBM-PC SIG

c/o Frank R. Neal
1358 Byron Ave.
Columbus, OH 43227
(613) 239-9300

The Ohio State University IBM PC-Users' Group

c/o Art Krumsee
Office of Continuing Education
210 Sullivant Hall
1813 North High St.
Columbus, OH 43212

OKLAHOMA

IBM PC Users Group

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Deloitte Haskins & Sells
700 Fidelity Plaza
Oklahoma City, OK 73102
(405) 232-6191

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PC Users Group

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P.O. Box 5070
Eugene, OR 97405

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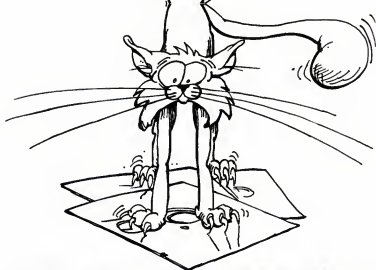


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(412) 561-1857
CompuServe: 71545467

Harrisburg PC Users Group
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1195 Fairmont Dr.
Harrisburg, PA 17112
(717) 652-9097

Microcomputer User Group (MUG)
The Pennsylvania State University
Computation Center
Computer Building
University Park, PA 16802

Philadelphia Area IBM PC Club
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2041 Harbour Dr.
Palmyra, NJ 08065
(609) 786-1441

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Tyler Hall
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Columbia, SC 29202

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Plaza Tower, #801
Oak Ridge, TN 37830
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P.O. Box 241756
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310 Honey Tree Ln.
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Austin, TX 78751

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PCjr.	C	I
3270 PC	D	J
XT/370	E	K
Other (specify)	F	L

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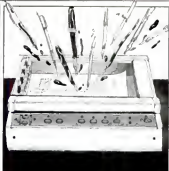
A PC Pen Plotter

Many PC owners already possess a low-cost pen plotter: a dot matrix printer. The trick is to harness its graphics capabilities through rasterization.

For all that has been written about pen plotters recently, because of their high cost, only businesses have been able to afford them. A low-cost alternative that has been largely overlooked is one that most persons with a PC already own; that is, any printer capable of bit graphics. A technique called rasterization permits dot matrix printers to be used as plotters.

To take advantage of this plotting capability, three steps are required: (1) Save pen movements in a file with this format: *x* location, *y* location, pen status (up or down). The output of this neutral plot file can be routed to any plotter capable of reading plot vectors. (2) Read the neutral plot file and convert it to a raster file. (3) Put the printer in bit-graphics mode and print the raster file.

The reason these steps are required is that printers only print in one direction, whereas plotters move forward and back over the whole plot panel until the plot is finished. The plotter pen moves under the direction of the computer (in the most simple case) by receiving plot vectors, that is, plotter instructions of the form: *x*-location, *y*-location, pen status. The plot vector instructs the pen to go to the intersection of *x* and *y* coordinates. Whether a line is drawn during the pen's movement is determined by the pen status, either up or down. Close inspection of plotted text will



reveal that characters are nothing more than a series of line segments.

Once you capture the plot vectors in a permanent file, you must convert this file into one that you can print. An understanding of bit-image graphics is useful for an understanding of how this file is constructed. The dot matrix printer, when printing text, gives commands to the print head to fire the pins necessary and in the proper sequence to generate the image of the character being printed. Each vertical column of pin-prints can be controlled by first instructing the printer that you want to go into bit-graphics mode and then by sending it 1 byte of information (a number between 0 and 255) to indicate which pins to fire. Thus, to print the character *I*, three bytes are used (trailing nulls ignored) in the sequence: 65, 127, 65.



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PROGRAMMING

When rasterizing vectors, you begin with a random-access (also known as indexed) file. Each record in the file is a line of bytes that are the pin-firing instructions to the printer in the graphics mode. For the Epson MX printer, the vertical dot spacing is 72 dots per inch, while the horizontal spacing is 60 (or 120) dots per inch. Knowing this, you convert the current x-y pen location (in plot inches) to the location within a character within a

Using a RAMdisk will improve the speed at which the raster file prints.

string in your random-access file. The pen location in inches (0.5, 1.25) equals pin location (36, 75). Because there are 8 pins vertically, the correct string in the random-access raster file is number 5, character (byte) number 75. Having retrieved this string and located this character, you now make the 4 bit equal to 1 using the OR logical operator;

```
(string #5, character #75) =  
(string #5, character #75)  
OR 8
```

This statement will turn on the fourth bit, without turning it off if it is already on.

"Drawing" occurs within the raster file as follows. If during a move to a new location, the pen status is pen down, the difference in dots between the new and old locations is determined for the x and y directions. The maximum number of dots for the two directions is then used as the index for the loop that increments from the current location to the new. At each increment, the appropriate bit is turned on. When the loop has ended, a line has been "drawn" from one point to another in the raster file. The new location becomes the current location and the next vector is read. When all vectors have been read, the raster file is ready to be printed.

Printing the raster file is the simplest

step. You put the printer in graphics mode and print one record at a time until all the records have been printed.

Figure 1 is a program that reads plot vectors of the form x, y, pen status and writes them to a random-access binary file. I use this file structure for two reasons: first, binary to conserve space (plot vector files can get large fast) and second, random access so I can write the minimum and maximum pen movements at the beginning of the file in known locations. That way, I can read the mins and maxs and know how big my plot will be before reading through the whole file—important for determining how many panels the finished plot will require. The end-of-input mark is indicated with pen status 999, pen down is 1, and pen up is 0.

To incorporate the code in Figure 1 into an application, simply determine the pen locations in inches as you would normally do when creating a plot. Go to the subroutine that writes the vectors instead of (or in addition to) sending the coordinates to the plotter. When the program has finished, process the plot vector file with the rasterizing routine. Using a RAMdisk will improve the speed at which the raster file prints.

While the BASIC interpreter will not allow a value larger than 255 if the program is compiled, the KBUF parameter can be set to a maximum of 32,767. Increasing this parameter will dramatically reduce the number of disk I/O operations being performed during rasterization. Panelizing plots wider than your printer and longer plots will be easier to do.

For a copy of the above text and the program on a disk, ready to run, please send \$8.00 to cover postage and handling to Mark A. Herkommer, 4005 Burning Tree Lane, Garland, Texas 75240.

Mark A. Herkommer is the senior technical programmer for Sohio Petroleum Company, the Mid-Continent Division, where he is responsible for graphics and mapping software applications.

```

100 CLS
110 PRINT " DEMOPLOT --- shows how to write plot vectors to a file and
120 convert them to a raster file for printing on dot-matrix printer.
130 PRINT "
140 PRINT " By Mark Hammer, 4005 Burning Tree Lane, Dallas, Texas 75042
150 PRINT "
160 PRINT " The plot axes are oriented on the printer paper thus:
170 PRINT "
180 PRINT " O,0 " "Y
190 PRINT " " "X
200 PRINT "
210 PRINT "
220 PRINT "
230 PRINT "
240 PRINT "
250 PRINT "
260 PRINT "
270 PRINT "
280 PRINT "
290 PRINT "
300 PRINT "
310 PRINT "
320 PRINT "
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970 PRINT "
980 PRINT "
990 PRINT "

```

```

990 RETURN
1000 '---write axes for a rectangle 1 by 2 inches with diagonals drawn in---
1010 DATA 0,0,0,0,0
1020 DATA 1,0,0,0,0
1030 DATA 1,0,0,0,0
1040 DATA 0,0,0,0,0
1050 DATA 0,0,0,0,0
1060 DATA 0,0,0,0,0
1070 DATA 0,0,0,0,0
1080 DATA 0,0,0,0,0
1090 DATA 0,0,0,0,0
1100 DATA 0,0,0,0,0
1110 OPEN "plotfile.dat" AS #1 LEN=4
1120 FIELD #1,2 AS I1M,2 AS I1Y,2 AS I2M,2 AS I2Y
1130 FOR I1M=0 TO 1:FOR I1Y=0 TO 1:FOR I2M=0 TO 1:FOR I2Y=0 TO 1
1140 GET #1,I1M,I1Y,I2M,I2Y:PRINT#1,I1M,I1Y,I2M,I2Y
1150 NEXT I1M,I1Y,I2M,I2Y
1160 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1170 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1180 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1190 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1200 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1210 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1220 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1230 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1240 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1250 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
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1290 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1300 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1310 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1320 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1330 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1340 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1350 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1360 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1370 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1380 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1390 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1400 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1410 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1420 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1430 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1440 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1450 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1460 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1470 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1480 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1490 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1500 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1510 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1520 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1530 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1540 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1550 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1560 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1570 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1580 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1590 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1600 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1610 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1620 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1630 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1640 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1650 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1660 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1670 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1680 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1690 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1700 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1710 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1720 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1730 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1740 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1750 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1760 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1770 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1780 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1790 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1800 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1810 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1820 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1830 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1840 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1850 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1860 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1870 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1880 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1890 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1900 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1910 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1920 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1930 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1940 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1950 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1960 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1970 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1980 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"
1990 PRINT#1 "Plot file name: I1M,I1Y,I2M,I2Y"

```

Figure 1: The DEMOPLOT program writes plot vectors to a file and converts them to a raster file for printing on a dot matrix printer.



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• EDITED BY PAUL SOMERSON

User-to-User

PC readers use this forum to help one another by passing along their questions, solutions, comments, and complaints.



DOS Function Keys

The ability to assign new or different meanings to the PC's function keys is a very handy feature. DOS 2.0 provides for this feature, but IBM's documentation is not much help. Kenneth Wood's article in PC ("Defining Function Keys in PC-DOS 2.0," PC, Volume 2 Number 1) was enlightening from an academic point of view, but unfortunately few of us have access to the C compiler you need in order to use his program.

The BASIC program in Figure 1 will reassign up to 20 keys. It works with the function keys in combination with the Alt, Ctrl, or shift keys; the regular typewriter keys; and the typewriter keys combined with the Alt key.

The program, which you can run in BASIC or BASICA, prompts you for the name of a file in which to store the key reassignments. If a file already exists, the program will display the reassignments already in that file so you can alter, add to, or delete any of them.

To add a carriage return at the end of a key reassignment, simply type in the left bracket character, "[". The program displays the left bracket on the screen but converts it to a real carriage return when writing to the file. You can substitute any other character for this left bracket if you want by changing the value of ZS.

As Ron Parsons pointed out in a previous "User-to-User" column (PC, Volume 2 Number 4), the key reassignment file has a maximum of 190 bytes. My program displays the number of unused bytes in the upper righthand corner of the screen. If you use Parson's DEBUG procedure to expand the reassignment table, change the value of BL! to reflect the increase.

To use the key reassignments once you've run the program and entered the new keystrokes, hit Enter to quit the program and save the data file, and then enter SYSTEM to go into DOS. At the DOS prompt A> enter:

TYPE filename

where filename is the name of the file in which you saved the new key reassignments. You can include this command in a batch file.

The function key reassignment will work only if you have ANSI.SYS on your disk plus a CONFIG.SYS file that includes the line:

DEVICE=ANSI.SYS

My program creates this short CONFIG.SYS file on your disk if it doesn't already find it there. This key reassignment works well with any of the DOS

commands and with DEBUG, EDLIN, and the Macroassembler. Some commercial programs override the reassignments. With such applications, you'll have to use a program like ProKey to reassign keys.

Michael O'Neill
Lucinda, Pennsylvania

This program is very useful and well thought out. One of its biggest advantages is that it lets you save different keyboard configuration data files for different uses; it is also generally friendly. It is one of the few we've seen that exploits the power of ANSI.SYS.

```
100 *** KEYCODE DOS key reassign progess *** by Michael L. D'Neill
110
120 For DOS 2.0 only -- and you must have ANSI.SYS on your disk!
130 To use: 1. Run this program under BASIC or BASICA
140 (Use the '[' character as a RETURN, or change Z# below)
150 2. This program stores data in a file that you name.
160 In DOS, enter the command: TYPE filename where the
170 filename is the name of this data file.
180
190 Z#=[ ' ' *Change Z# to whatever desired for carriage return
200 ELI=190 *Number of bytes available
210 KEY OFF:CLS
220 ON ERROR GOTO 360
230 FOR I=1 TO 10:KEY I,":NEXT I
240 GIE A$(20) 'A# = Name of Redefined Key
250 BE B$(20) 'B# = String Assigned to Key
260 DIN C$(20) 'C# = String saved to DOS file
270 DIE E$(132) 'E# = Extended Code Key Name
280 GORUE 1270 *Check for CONVID.SYS file on disk
290 GORUE 920 *Load Extended Codes into E# array
300 GORUE 410 *Ask filename, input existing definitions from it
310 GORUE 490 *Print existing definitions to screen
320 GORUE 620 *Solidify key to be redefined, or quit
330 GORUE 1120
340 LOCATE 23,1:END
350
360 -- Error handling subroutine --
370
380 IF ERR=440 AND ERR=53 THEN RESUME 470 'If ERR=53 then new file
390 IF ERR=1320 AND ERR=53 THEN RESUME 1340 ELSE END
400
410 -- Open key file to hold definitions for later use in DOS --
420
430 INPUT "ENTER NAME OF FILE ",F$:CLS
440 OPEN "I":F$,F$
450 I=1:WHILE NOT EOF(1):LINE INPUT #1,C$(1):E=I+1:VEND
460 CLOSE
470 RETURN
480
490 -- List current definitions --
500
510 CLS:LOCATE 1,1:PRINT "Filename: ";F$:TAB(30);"Carriage Return = ";Z#;
520 E=0:I=1:WHILE C$(I)<>" "
530 'Get A$(I) and B$(I) from C$(I)
540 E=E+LEN(B$(I))+1
550 LOCATE I+2,5:PRINT A$(I),B$(I);
560 I=I+1:VEND
570 LOCATE 25,1:PRINT SPACES(60);
580 LOCATE 25,1:PRINT "Press key to be redefined. Press ENTER to Quit.";
590 LOCATE 1,60:PRINT "Press left ";ELI-R+1;
600 RETURN
610
620 -- Redefine a key --
630
640 I=INKEY$:IF I="" THEN 640 ELSE IF I=CHR$(13) THEN RETURN
650 IF LEN(I)=1 THEN A$(I)=I: E=CHR$(Z#):"":GIE B$(A$(I)),2,3)
660 IF ASC(I)=32 THEN A$(I)="Space Bar"
670 IF LEN(I)>2 THEN 700
680 A$(I)=E:ASC(RIGHT$(I,1))
690 E=CHR$(Z#)+I: "HIDE(STR$(ASC(RIGHT$(I,1))),2)
700 FOR J=1 TO 20:IF A$(J)=A$(I) THEN I=J:J=20
710 NEXT J
720 LOCATE 25,1:PRINT SPACES(60);LOCATE 25,1:E="p"
730 PRINT "Enter New String for Key ";A$(I);": ";(IF INPUT;B$(I)
740 IF B$(I)="" THEN GORUE 1210:GOTO 770 *Delete a redefinition
750 IF INSTR(B$(I),28)<0 THEN E=LEFT$(B$(I),INSTR(B$(I),28)-1):E="13p"
760 C$(I)=E+"":CHR$(34)+E(I)+CHR$(34)+E
770 GORUE 490
780 RETURN 320
790
800 -- Get key name and redefinition --
810
```

(continued)

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USER-TO-USER

```

620 IF NIDC(C(I),3,1)=0 THEN L1=2:GOTO 860
630 L1=1: A=(I)-CHR$(VAL(NIDC(C(I),3,INSTR(C(I),",")-3)))
640 IF NIDC(C(I),3,2)=32 THEN A=(I)-"Space Bar"
850 GOTO 870
860 A=(I)-E$(VAL(NIDC(C(I),3,INSTR(C(I),",")-3))) 'Extended Code Key
870 B1=INSTR(C(I),CHR$(34))+1 'First Character after Quotation Mark
880 B=(I)-NIDC(C(I),B1,INSTR(B1,C(I),CHR$(34))-1)
890 IF INSTR(C(I),",13p")<0 THEN B=(I)-B$(I)-26
900 RETURN
910 '
920 ' -- Fill In Array with Extended Codes --
930
940 E$(15)="Shift Tab"
950 GOSUB 1100:DATA 16,25,Ait-G,Ait-W,Ait-E,Ait-H,Ait-T,Ait-U,Ait-I
960 DATA Ait-G,Ait-F
970 GOSUB 1100:DATA 30,36,Ait-A,Ait-B,Ait-G,Ait-F,Ait-G,Ait-H,Ait-J,Ait-E,Ait-L
980 GOSUB 1100:DATA 44,50,Ait-Z,Ait-E,Ait-C,Ait-T,Ait-B,Ait-N,Ait-H
990 GOSUB 1100:DATA 59,68,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10
1000 GOSUB 1100:DATA 71,83,Home,Car Up,Fg Up,O,Car Left,O,Car Right,O,End
1010 DATA Car Down,Fg On,Ins,Del
1020 GOSUB 1100:DATA 84,93,B1,B2,B3,B4,B5,B6,B7,B8,B9,B10
1030 GOSUB 1100:DATA 94,103,C1,C2,C3,C4,C5,C6,C7,C8,C9,C10
1040 GOSUB 1100:DATA 104,113,A1,A2,A3,A4,A5,A6,A7,A8,A9,A10
1050 GOSUB 1100:DATA 114,119,Ctrl-FrtSc,Ctrl-Cer Left,Ctrl-Cer Rt,Ctrl-End
1060 DATA Ctrl-Fg,Del,Ctrl-Home
1070 GOSUB 1100:DATA 120,132,Ait-1,Ait-2,Ait-3,Ait-4,Ait-5,Ait-6,Ait-7,Ait-8
1080 DATA Ait-9,Ait-0,Ait-,Ait-,Ait-,Ctrl-FgUp
1090 RETURN
1100 HEAD J1,J2:FOR J=J1 TO J2:READ E$(J):NEXT:RETURN
1110 '
1120 ' -- Save to disk end close file --
1130 '
1140 LOCATE 25,1:PRINT SPACE$(79):LOCATE 25,1:PRINT "Writing to file ";F$;
1150 OPEN "O",#1:F$
1160 I=1:WHILE C(I)<>" "
1170 PRINT #1,C(I)
1180 I=I+1:WEND
1190 CLOSE #1:RETURN
1200 '
1210 ' -- Delete on itee --
1220 '
1230 A$(I)=1
1240 WHILE C(I)=1<>" ":(C(I)=C(I)-1:I=I+1:WEND
1250 C(I)=1: RETURN
1260 '
1270 ' -- Create file CONFIG.BTS if necessary --
1280 '
1290 CL$:PRINT "Insert disk to receive key reassignment file."
1300 PRINT "Press any key when ready."
1310 IF INKEY$=" " THEN 1310
1320 OPEN "I",#2,"CONFIG.BTS"
1330 CLOSE #2:GOTO 1370 'File already exists
1340 OPEN "O",#2,"CONFIG.BTS"
1350 PRINT #2,"DEVICE=ANSI.BTS";
1360 CLOSE #2
1370 RETURN

```

Figure 1: Key reassignment program.

Default Lies within Ourselves

I was recently writing a BASIC program in which I needed to change the default drive. Since there is no way to do this in BASIC (that I know of), I decided to write my own program (which is shown in Figures 2 and 3).

David Meyer
Wilmington, Delaware

There are many DOS functions you can't normally use in BASIC, and this program lets you get at one of them. We changed the program for demonstration purposes in line 5110 by displaying the files on the

drive selected and then going back to let the user choose a new drive. If you want to use this as a subroutine in your own program, replace line 5110 with:

```
5110 RETURN
```

We also added one of our favorite routines for allowing a user to input information. Line 5050 takes the input from the previous line and tests it, using the INSTR function, which looks for the first occurrence of one string in another. In this case, the allowable responses are A, a, B, b, C, and c. If the user enters A, INSTR returns a 1; if he enters a, INSTR returns a 2, and

so on. If the user enters anything not inside the quotes, INSTR returns a 0 and jumps to the next line, which sends the program back to ask for a new input.

By using CINT and dividing by 2, and setting up the INSTR line with each capital letter followed by its lowercase equivalent, the program lets the user type responses in regardless of whether they're uppercase or lowercase. (You don't have to put the capitals first; you just have to put them in pairs in any order—"AaBbCc" works as well as "aAbBcC" or even "AaBbCc".)

If you do use this subroutine, make sure

you reset the segment. This program changes it from the default with a new DEF SEG in line 5020.

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DefDrive.asm

```

0100      1  DEFDRIVE   PROC   FAR
0100      2  -----
0100      3  ; Switches the default
0100      4  ; drive by using INT 21.
0100      5  ;
0100      6  NOTE - This program will
0100      7  ; not work in DOS.
0100      8  ; It must be converted
0100      9  ; into BASIC DATA
0100     10  ; statements and
0100     11  ; executed with CALL.
0100     12  ;-----
0100     13
0100     14  PUSH BP      ; Get parameter
0100     15  MOV BP,SP    ; Put it into OL
0100     16  MOV SI,6(BP) ; 1 for Drive A
0100     17  MOV DI,[SI]  ; 2 for Drive B
0100     18              ; etc.
0100     19  MOV AH,0EH   ; Set default drive
0100     20  INT 21H      ; DOS function call
0100     21  POP BP      ; Restore BP
0100     22  RET 02H     ;
0100     23  ENDP       ;

```

Figure 2: Assembler program to reset disk drive defaults.

```

5000 ' Default drive switcher -- by David Meyer
5010 '
5020 DEF SEG=&HF20
5030 FOR I=0 TO 16:READ A:POKE I,A:NEXT
5040 INPUT "Enter default drive (A, B, or C): ",D$
5050 ON CINT(INSTR("AaBbCc",D$)/2) GOTO 5070,5080,5090
5060 BEEP:CLS:GOTO 5040
5070 DD$=0:GOTO 5100
5080 DD$=1:GOTO 5100
5090 DD$=2
5100 XI=0:CALL XX(DD$)
5110 FILES:GOTO 5040
5120 '
5130 ' -- data: don't skip the trailing &H00s --
5140 '
5150 DATA &H55,&H8B,&HEC,&H8B,&H76,&H06,&H8A,&H14,&H84,&H0E
5160 DATA &HCD,&H21,&H5D,&HCA,&H02,&H00,&H00,&H00,&H00,&H00

```

Figure 3: BASIC program to create DEFDRIVE program.

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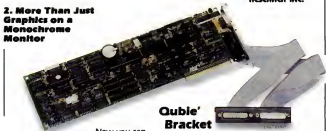
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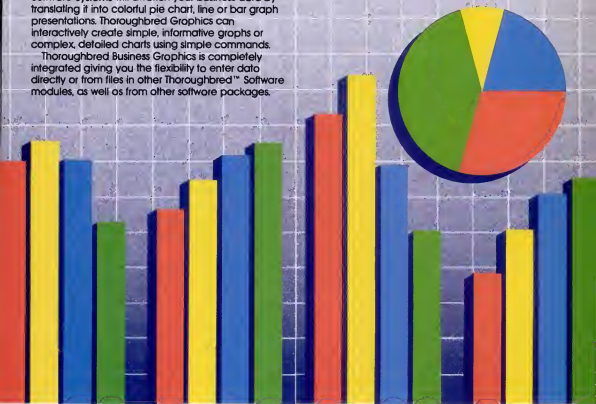
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PC Tutor

Chip Changing

Q: I have a European-model IBM PC that was built in England, and only has 64K RAM on the motherboard. When I bought it, I didn't realize that a newer model with up to 256K was already available. Although I wish my dealer had mentioned

compared to doing a few hours of critical mechanical work yourself.

Starting Up a Hard Disk

Q: I recently bought an XT-compatible hard disk for my 64K PC, which already has a board with an additional 256K RAM. When I installed the hard disk, nothing happened.

PC-DOS refuses to believe that a hard disk is attached to my system. My attempts to run the FDISK program to format the hard disk just elicit the response, "No Hard Disk Attached." Can you explain what is wrong?

Carl Kemen
Atlanta, Georgia

A: Your problem lies in owning one of the earliest IBM PCs. Usually, XT-compatible add-on hard disks are designed to be used with a more recent IBM PC with 256K RAM and a new set of ROM chips. (The newer IBM PC was introduced at the same time as the PC XT, and is sometimes called the PC2.)

When you turn on your "PC1," the system follows this startup procedure: First it runs routines that check out the system and look for any problems with the RAM chips. Then it runs a bootstrap routine in ROM that tries to read the first sector in on a disk in drive A: If it reads a booting file from the disk, it loads PC-DOS; if it fails to read the disk, the system loads Cassette BASIC from ROM.

The PC2's new ROM set has a slightly different startup procedure. (See the flowchart in Figure 1, which compares the two startups.) After the initial checkout, the system looks for ROM modules before starting up the standard ROM bootstrap routine. These optional ROM modules are attached to accommodate add-on hardware such as a hard disk's controller



this fact to me, my 64K system works just fine, and I bought an expansion card to increase the memory.

It occurred to me that replacing the 16K memory chips on the motherboard with 64K chips might be a way to add memory without tying up an expansion slot. Is this possible?

Albert V. Sangerman
APO New York, New York

A: The only way to replace 16K chips with 64K chips involves a fair amount of trace cutting and resoldering. Doing this might damage your system's motherboard and would certainly void its warranty. Also, the switches on the system board would have to be interpreted differently.

I suggest you stick with the solution that's already worked for you—using an expansion board. Even though a memory board is more expensive than the chips themselves, the expense seems worthwhile

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PC TUTOR

0DE3 0100 31C0	XOR	AX, AX	: read keyboard
0DE3 0102 C014	INT	16	: (i.e., PAUSE)
0DE3 0104 9A030000C6	CALL	CR00 0003	: call hard-disk initialization
			: interrupts
0DE3 0109 E461	IN	AL, 61	
0DE3 010B 0C30	DP	AL, 30	
0DE3 010D E461	OUT	61, AL	
0DE3 010F 24CF	AND	AL, CF	
0DE3 0111 E461	OUT	61, AL	
0DE3 0113 B0B0	MOV	AL, D0	
0DE3 0115 E4A0	OUT	A0, AL	
0DE3 0117 B0C6	MOV	AL, C6	
0DE3 0119 BAF203	MOV	DX, D3F2	: turn off disk drive
0DE3 011C E4	OUT	DX, AL	
0DE3 011F E421	IN	AL, 21	: turn on timer
0DE3 011F 24FC	AND	AL, FC	
0DE3 0121 E421	OUT	21, AL	
0DE3 0123 CD19	INT	19	: boot from hard disk

Figure 1: An assembly language routine that enables a hard disk to run under PC-DOS 2.0 on early model IBM PCs (PC1s).

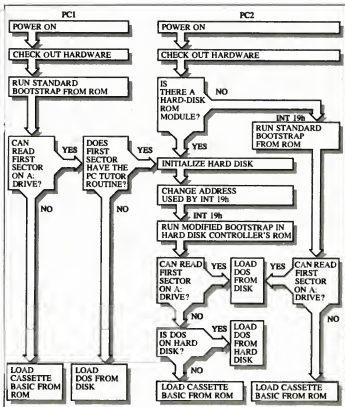


Figure 2: A flowchart showing the startup procedures for PC1 and PC2. The routine in Figure 1 enables a PC1 system to emulate the PC2's way of initializing a hard disk.

PC TUTOR

card. The system looks for ROM modules at addresses from C800 to F800 and can identify them because their codes begin with the hex value 55AA.

In the XT, a ROM module attached to the hard disk controller has a routine that initializes the hard disk and changes the address at which the system will look for a bootstrap routine when INT 19h is executed. Unlike the PC1, which executes a standard bootstrap routine in ROM immediately after the hardware check is completed, the XT performs its hard disk initialization (and any routines stored in other ROM modules) before calling any bootstrap routine. In the case of the XT, the hard disk's ROM module directs INT 19h to a different address for its bootstrap routine. When this modified bootstrap runs, it will try to read drive A: first; but if this fails, the bootstrap routine looks for DOS files on the hard disk before it resorts to loading Cassette BASIC.

You need a way to have your PC1 simulate the most important parts of the XT's start-up operation—namely, calling the hard disk initialization routine on its ROM module and performing the interrupt (INT 19h). You can accomplish this without buying a new BIOS ROM chip if your system runs PC-DOS 2.0.

The assembly language code in Figure 2 will create this start-up routine: First, the computer will wait for you to press a key before you proceed, giving you a chance to put a boot disk in drive A: if you wish. After you press a key, this routine initializes the hard disk by calling the code at C800:0003, then resets a few ports that the initialization routine might have set, and finally calls the hard disk bootstrap with INT 19h.

To use the code in Figure 2, you need to put it into the first, bootstrap sector of a diskette. When the old PC1 bootstrap in ROM reads your new code off this diskette in drive A:, it will cause the system to run the hard disk's own bootstrap routine.

To get the code onto a diskette, use a blank diskette, because it will be useless for anything else while it contains this

altered file. First, enter

DEBUG

after the A> prompt. Now put the blank formatted diskette in drive A:. When DEBUG's hyphen prompt appears on the screen, enter

A100

to assemble the contents at 100. Now, as the addresses appear, start entering the code in the right-hand columns of Figure 2. (In sample lines below, the first four digits are indicated by "xxxx" rather than "ODE3" because the DEBUG address might be different, but any difference here doesn't really matter.)

xxxx:0100 XOR AX AX

xxxx:0102 INT 16

xxxx:0104

xxxx:0106

xxxx:0108

xxxx:0123 INT 19

xxxx:0125

Leave this last line blank. Then, when the DEBUG prompt appears again, write this code to sector 0 of the diskette by entering the following:

-W100 0 0 1

Then enter a Q to return to PC-DOS.

To use the disk with this program, put it into drive A: when you power up your PC. The drive's light will come on and the disk will whir for about a second. When it stops, you can remove this special disk. Then you can leave the A drive's door open, press any key, and have PC-DOS bootup from system files on the hard disk. Or you can insert a standard PC-DOS 2.0 system disk in drive A: before pressing a key. Either way, the hard disk will be recognized by your system.

The PC Tutor solves practical problems and explains points of general interest. If you'd like to see your questions answered here, drop a line to PC Tutor, PC Magazine, One Park Avenue, New York, NY 10016. ■

COMING UP



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In addition to the product reviews, you'll find a guide to help you navigate around one small glitch in the standard IBM debugger, and a simple program that enables programmers to single-step through BASIC programs while keeping track of the value of a selected variable.

Local Area Networks, Continued

The next chapter in Tech Journal's continuing coverage of products in this developing area is a report on XCOMP's X-Net, a network that connects PCs via twisted pair wires.

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It's dark in my office. The only light is the green glow of a single line of text on the PC monitor: "Log-on Will Commence at 22:15." Next to that line, in the upper right-hand corner of the screen, a small digital clock display silently blinks away the minutes. Next to the PC system unit a Hayes Smartmodem 1200 stares red-eyed into space, waiting.

I'm at the movies, watching a screen of a different sort in another darkened room. Or I'm downstairs watching *Hill Street Blues*. Or I'm somewhere else. But at 10:15 p.m. my system will boot the communications software in drive A:, open a capture buffer, sign on to The Source, download my mail, read the latest

messages on the IBM PC Source bulletin board, and sign off. The system will then close the capture buffer and dump its contents to the disk in the B: drive.

Next, the system will exit to DOS and run COLBLNK.COM to make the screen go blank after 5 minutes of inactivity, thus prolonging the life of my color monitor. When I return, I have only to hit a key to bring the screen back to life and proceed to read, edit, and print out the material.

Leading Edge on a Low Budget

Like all personal computer software, communications programs are continually evolving. Features that permit automatic sign-on and other unattended operations

have already begun to appear, and they are sure to become even more popular in the future. There's just one problem—they are also almost certain to end up costing you more money.

Can you do it on a low budget? After a lot of digging, a little programming, and hours of testing, I'm happy to report that it can be done for far less than you might imagine. If you have an auto-dial modem, a PC, PCjr or other MS-DOS machine equipped for communications; and an 80-column display, you will not need any additional hardware. If you already have a communications program, your total additional software cost can be just \$5.

The key that unlocks the wonders of unattended, fully automatic operations is a program called *Extended Batch Language (EBL)* from Seaware Corp. of Delray Beach, Florida. (See "A Command Performance, PC, Volume 3 Number 9 for a review of *EBL*.) Written by Frank Canova, an IBM employee in Boca Raton, *EBL* is similar to the popular EXEC program found on IBM VM370 mainframe systems. Indeed, Canova wrote it because he felt a need for EXEC capabilities on the PC. Perhaps an easier way to describe *EBL* is to say that it allows you to "program" in PC-DOS as easily as you program in BASIC. Among other things, for example, *EBL* can read a given line on your screen and take appropriate action

(such as booting your communications program) if the contents of the line match what you have specified.

Canova submitted *EBL* to the powers that be at IBM and received official permission to market it on his own. He offers the disk for \$5, and he requests a contribution of \$30 from users who like the program. Contributors receive a 70-page IBM-style manual, telephone support, and a password to Canova's BAT-BBS bulletin board system.

A Matter of Time

A batch file consists of a list of DOS commands that the system executes one after the other. The file name ends with the ".BAT" extension and can be created with a text editor or with the COPY CON command. *EBL* works the same way; the difference is that an *EBL* file can contain any DOS command plus a variety of *EBL* commands.

In essence, there are three main problems to be solved. The first is the matter of time. You must tell the system at what time you want it to run the communications program. The system must also be able to constantly monitor the current time and compare it to what you have specified. *EBL* makes it easy. As with BASIC, you prepare a prompt requesting the target information and accept the keyboard response as a variable. For example, if you included

```
BAT READ Please enter log-on
time %I
```

as an instruction in your *EBL* batch file, the target time would be assigned to the DOS variable %I.

There are many ways to let the *EBL* program monitor the time, and none of them requires a clock/calendar card or any other peripheral. Many free clock programs are available—from users groups or in the Programming database (XA6) of the IBM PC SIG on CompuServe—that will display a small digital clock in the upper right-hand corner of your screen. You can also use the system clock that you

set each time you boot DOS.

To use the system clock, you have only to include the DOS command TIME in your batch file and add an *EBL* loop to cause that command to be entered repeatedly. As you know, whenever TIME is entered, DOS comes back with "Current Time is HH:MM:SS.nn." By entering

```
BAT READSCRN %A %B %C %D
```

in your file, you can cause *EBL* to read that line on the screen and assign each "word" to a variable. In this case, the DOS variable %D would contain the time. If you can find a way to get the time displayed on the screen, *EBL* can read it.

Finally, *EBL* lets you include a line like:

```
BAT IF %I < %D GOTO -TIME
```

This causes the program to compare the target time you entered (%I) to the current time (%D). The word -TIME could be the label of the *EBL* subroutine that causes the DOS TIME command to be entered. The loop will repeat until the current time is greater than the time you specified. At that point, *EBL* will execute the next line in the file, which might be PC-TALK, IRD, SYSCOMM, or whatever is needed to start your communications program.

How EBL Stacks Up

The second problem is the handling of the auto log-in once the communications program has been started. *EBL* does this by pulling commands and responses off its keyboard stack and feeding them to the program. As its name implies, the *EBL* keyboard stack is a list of responses queued up and issued as if they came from someone sitting at the keyboard.

Naturally, the exact commands you put on the stack when preparing your *EBL* batch file will vary with the communications software you are using. However, any key can be included as can any text, such as "ATDT 555-1212" to tell a Hayes modem to dial a number. If you are using a program like *PC-Talk III* or *PC-Dial*, it's even simpler. Both of

these programs allow you to dial a number and send sign-on information by pressing one of the function keys or a simple combination.

You can incorporate delays of any desired length between the commands on the stack. These delays are crucial since you must allow time for the program to respond to each command. Also, the response time of the on-line services you use varies with the time of day and the number of callers on the system.

Adjusting the delays between commands can be tricky. Fortunately, there's an easier way: Use a program that can read the prompts sent by the remote computer. A program such as *SYSCOMM* from Microlife, Inc. of Jessup, Maryland, for example, can be set up to send a Telenet address for The Source (C 30128) only after it sees the Telenet prompt "@." To initiate an auto log-on with *SYSCOMM*, the *EBL* file has only to send "F5" and a letter corresponding to an entry in the *SYSCOMM* dialing directory. From then on everything proceeds automatically.

SYSCOMM offers the XMODEM protocol, user-selectable colors, a split-screen capability, a well-written manual, full support, and other features. At \$40, it is one of the least expensive programs with a smooth-running auto log-on feature.

The final problem is telling the remote database to send you the information you want and then signing off to stop the connect time meter. You could do this with *EBL* by entering words like MAILCK or GO EMA1, the commands needed to check electronic mailboxes on The Source and CompuServe. But there may be easier ways to do it.

Complete automation is clearly the coming thing in communications software, and it seems likely that the future will see even greater sophistication in this area. But you don't have to wait. Thanks to *Extended Batch Language*, you can see it right now on your own system—or not see it, if you happen to be at the movies, watching television, or in bed while your PC is executing your commands. ■

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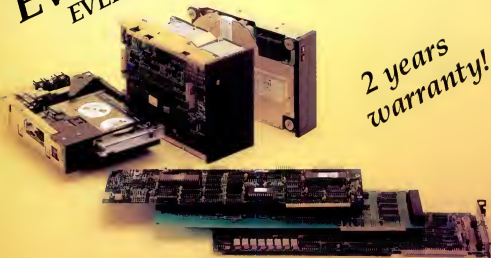


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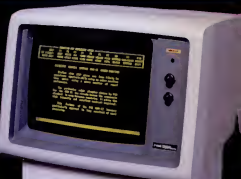
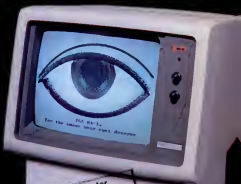
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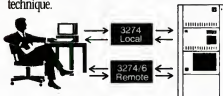
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Coming Up

DBMS Packages

PC presents a series of reports reviewing the 65 database management software packages on the market today. The first of the series, appearing in the next issue of *PC*, will take a look at the lowest level of DBMS—databases that act as electronic fileboxes, allowing the user to access information as records or fields. These products compete with one another on the basis of ease of use, speed, capacity, and price—and the competition is mighty fierce.

UNIX

This second part of a special report covers UNIX and its suite of related software. The operating system began life as one programmer's off-hours hobby and ended up as a favorite that is easily understood, used, and modified by software designers. We'll examine the new UNIX-like operating systems developed since version 7—including VENIX, PC/IX, and uNETix—and instruct you on their operation.

MS-Windows

From the company that introduced microcomputer BASIC comes a new windowing system, Microsoft's *MS-Windows*. *PC* will review *MS-Windows* and show what it offers in comparison to similar systems, such as *Desq* and *Visi On*.

Volkswriter Deluxe

Writer Dara Pearlman fell in love at first sight with the original *Volkswriter*, and likes *Volkswriter Deluxe* even better. Here's Pearlman's look at this new, much enhanced version, which uses the PC's extended character set to make foreign characters a standard feature of word processing.

How to Buy a Used PC

The PC is more than 2 years old, so a market for used machines is beginning to emerge. If you've been waiting around for PC prices to drop and they still haven't fallen far enough, you might consider purchasing a second-hand PC. We'll tell you where to look, what to test in a used machine, and how to negotiate payment.

PC in the Pulpit

Here's the story of how one church uses a PC-XT and a church management software package to unite its scattered 2,000-member congregation. Modern automation keeps track of church paperwork and mailing lists. In addition, the PC coordinates community outreach for older persons, and helps the pastor keep his sermons and services fresh.

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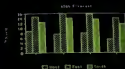
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